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# THE CONDOR

A Magazine of Western  
Ornithology

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Number 3



COOPER ORNITHOLOGICAL CLUB

# THE CONDOR

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## THE SOOTY SHEARWATER IN NEW ZEALAND

By L. E. RICHDALE

The Sooty Shearwater (*Puffinus griseus*) is the most common sea bird in New Zealand waters, where there must be several million individuals. From the last few days in September to the middle of November an observer on any of the headlands of the Otago Peninsula, New Zealand, may see this species flying south in an endless stream. The flight, however, is not continuous, for many pauses are made for feeding. It is on such occasions that huge flocks are noticed resting on the waters of various bays along the coast.

This shearwater is locally known as the mutton-bird and the young are taken annually for food by those Maoris who have acquired ancestral rights. Europeans who are married to such natives also have a legal right to participate in these activities. Beginning on the first of April of each year, the season extends to about the middle of May. Although no exact tally is kept, it is estimated that nearly 250,000 birds are taken in a good season.

The term "mutton-bird" is usually reserved for *Puffinus griseus* but to the Maori several species are included. In fact anything that is edible and can be "bagged up" is a mutton-bird. In this connection species involved in southern New Zealand include a bird known as the Korure, which is either *Pterodroma inexpecta* or *P. cookii*, or both. I have not yet had an opportunity to verify this point but both species live on some of the mutton-bird islands. If they are available, the adults of *Pachyptila vittata* [= *forsteri*] are caught at this period, and the Weka (*Gallirallus australis*), too, may find its way into the preserving bags.

In the northern part of New Zealand the mutton-bird is *Pterodroma macroptera*, which is taken regularly in the Bay of Plenty area during November, though in small numbers. *Puffinus gavia* [= *reinholdi*] has probably, on odd occasions, also been used in the north (Buller, 1888:237). On the southern Australian and Bass Strait Islands the mutton-bird is *P. tenuirostris* (Wood-Jones, 1936:198).

The bulk of the field work from which the data for this paper were obtained was carried out on the small island of Whero, situated off the northeast corner of Stewart Island, New Zealand. An aggregate of twenty-nine weeks has been spent on this island between December 26, 1938, and January 26, 1943. Some preliminary observations made on the trip in 1940-41 have been published (Richdale, 1942:94-105), but since then two further sojourns of three months and two months, respectively, have resulted in the collection of a considerable amount of additional material.

In several places reference has been made to other species of petrels studied. It is hoped that such comparisons will help to make more intelligible similar behavior on the part of the Sooty Shearwater.

### RANGE OF THE SPECIES

Murphy (1936:667) has shown that "the Sooty Shearwater is an abundant sea bird throughout the length of the oceans on either side of the Americas, from the lati-

tude of Cape Horn northward to arctic waters. It is particularly numerous along the Pacific coasts of North and South America." Mr. R. M. Lockley, in a private communication, stated that he sees the species occasionally from Skokholm off the coast of Wales. It would appear also that in the northern hemisphere individuals of this shearwater are present during the whole year whereas in the southern hemisphere they occur only in the breeding season.

Beck (1910:65-66) and others have seen them in every month of the year off the California coast, as at Point Pinos. The only possible out-of-season record I have is the sighting of a single *P. griseus* near The Traps just off the southeast extremity of Stewart



Fig. 13. Shearwater islands, off Stewart Island, New Zealand.

Island on August 27, 1942. My informant was a fisherman who, during the season, is also engaged in the mutton-bird industry.

The breeding range includes southern South America and the waters around New Zealand, more particularly in the south. In the former area Beck found them breeding in 1915 on an island near Cape Horn, and there are inconclusive records that they breed on the coastal tableland of northern Chile (Murphy, 1936:670-671). A doubtful record is that of their breeding on the Falkland Islands (Bennett, 1926:314). In Australia there is only one authenticated breeding locality and that is on Tasman Island off Cape Pillar, Tasmania, where there is a small nesting colony associated with the more common *P. tenuirostris* (Wood-Jones, 1936:197). There is an alleged Australian breeding record reported by Hull (1911:101). From an eggless burrow on Broughton Island off the coast of New South Wales, he took a bird which he identified as *P. griseus*. It was found in a colony of *P. pacificus* on January 29, 1911; no others were located either then or on a later visit. Dr. D. L. Serventy in a private communication remarks that it had evidently come ashore but not for breeding and also that this species accompanies the abundant *P. tenuirostris* on its spring migration down the east Australian coast. In regard to Hull's bird it is interesting to note that eggs of *P. griseus* begin to hatch on January 18. It seems obvious, therefore, that the stray at Broughton Island was a mem-



ber of the unemployed section which quite frequently occupies empty burrows at the end of January.

In New Zealand, the popular belief is that mutton-birds breed only on islands near Stewart Island, but this is incorrect. They nest on several islands off the east coast of northern New Zealand between the Three Kings Islands, their northernmost breeding station in New Zealand (Fleming, private communication), and the Bay of Plenty (Sandager, 1890:290; Sladden and Falla, 1928:283; Falla, 1934:251; Buddle, 1941:58). Near Wellington they breed on Kapiti Island (Buller, 1888:232; Wilkinson, 1931:232; Kirk and Wodzicki, 1943:7) and Mana Island (Fleming, private communication). At Okarito, well down the west coast of the South Island, there is a further record (Rept. Ornith. Soc. N. Z., 1940:5). On the Otago coast at various points, including Moeraki Island, Otago Peninsula, Taieri Island, and Rainbow Island off the Catlins coast, I have found them breeding.

At Stewart Island and its outlying islands, and on the mainland coast north of Foveaux Strait, the species is very common. On the Snares it is more numerous still, but as the island is a bird sanctuary and a light-house reserve, it is not worked by "birders." The identity of the species there has been definitely established as *griseus* by Stead (1932:67). The Sooty Shearwater is recorded on the Auckland Islands by Waite (1909:563), and by Wilson (1907:80) who saw huge flocks in Laurie Harbour in March, while Chapman (1891:504) in January, 1890, had a similar experience in the south just before entering Carnley Harbour. Filhol (1885:52) states that on Campbell Island the birds breed in thousands, while Hamilton (1895:562 and 574), Campbell (1900:894), and Falla (1937:206) have noted them on Macquarie Island. On the Chathams, Fleming (1939:401) states that they are still common. I can find no record of their occurrence on Antipodes Island where they most likely breed.

Finally, there is a record according to Buller (1888:233), Bent (1922:90), and Oliver (1912:220; 1930:122) of their existence on Norfolk Island. I do not think this is correct. Buller refers to Crowfoot (1885:268) whose observations and records, notably the small egg measurements, are clearly not referable to *griseus*. Oliver apparently relies on Hull's record (1909:648) for assigning *griseus* to Norfolk Island. Hull's egg measurements,  $2.58 \times 1.78$  and  $2.6 \times 1.6$  inches, are much smaller than any I have recorded. If *griseus* does breed on Norfolk Island, it would indeed be unusual for a subantarctic species, whose presence even off the Auckland coast is strange.

#### THE PRE-LAYING PERIOD

It has not been possible for me to glean much information about this portion of the Sooty Shearwater's breeding cycle. Beck states (1910:66) that in 1907 off Point Pinos, California, he saw a gathering of fully 20,000 on November 4, and he considers this to be a late date for such large numbers. Bent (1922:86) remarks that "the southward movement of this species [*P. griseus*], which is really its spring migration, begins in September and the bulk of the flight is over before the end of that month, though it is still to be found here in diminishing numbers during October and November on both our Atlantic and Pacific coasts." On the same page he quotes another observer writing in 1902 to the effect that there is a sudden decrease in the numbers of shearwaters off Monterey, California, in September.

It would seem then that the bulk of the birds usually leaves northern waters by the end of October. In the course of my several visits to Stewart Island between August 20 and September 3 I have never seen a shearwater, nor has there been any sign whatsoever of spring cleaning of the burrows. On September 10, 1874, at Campbell Island,

which is south of New Zealand, Filhol (1885:53), found many uncleaned burrows but no sign of inhabitants. Guthrie-Smith (1914:17) when on a large mutton-bird island on September 22, 1911, saw no trace of the birds. On October 2, however, he noticed that they had arrived and were quite numerous (*op. cit.*: 19-27). An observer on Stewart Island notes (Rept. Ornith. Soc. N. Z., 1940:5) that off Southwest Cape at Stewart Island he saw one bird on September 22, 1939, and three days later about a dozen. This area is in close proximity to the most densely populated mutton-bird islands. My own observations over many years off the Otago Peninsula indicate that the birds first appear at the very end of September and continue flying past till about the middle of November, although during the final two weeks their numbers are relatively small.

In 1943 I first noticed them on September 25 in some hundreds only, spread evenly as far as the eye could see in every direction. They could not be seen from shore on September 19. Mr. T. Middendorf, while fishing in his launch on September 14 and 15, saw about thirty or forty between Taieri Island and Nugget Point. By sea, these places are twenty and fifty-five miles south of Dunedin. He was not out again until September 29 when the birds were quite numerous. Between September 11 and 14, another friend, also in a launch, some 100 miles below Dunedin, did not observe the species at all.

To sum up, it is apparent that the Sooty Shearwaters reach their main breeding ground at Stewart Island and islands to the south during the last week of September, while at the same time there are still large numbers left in the northern hemisphere.

Oliver states (1930:122) that the mutton-birders contend that on the southern journey the young precede the older birds. I am not convinced that this is so. There is a considerable amount of erroneous matter written pertaining to this shearwater, especially in the lighter literature, due to too much reliance being placed on the tales of the mutton-birders. As these people are on the nesting islands only during the six weeks at the end of the season, it is hardly possible that they have acquired their information from direct observation. The fallacy, still believed, that all mutton-birds lay their eggs on November 25 is an example. My researches on the Royal Albatross (*Diomedea epomophora sandfordi*) indicate that in the main it is the breeding birds which tend to arrive first, with the non-breeding birds more in evidence a little later on. Lockley (1942:24), dealing with the Manx Shearwaters (*P. puffinus puffinus*) has stated that there is no set order and that "old males and females might arrive first, or they might follow young birds which apparently had never bred before." Some years earlier (1935:107) he gave evidence supporting his theory "that the non-breeders . . . return late to the breeding grounds."

As I have never been on the breeding grounds when the birds arrive, I am not in a position to say what happens. The pre-laying period would appear to last about a month, as I have found with other petrels that I have studied. Although there is a considerable amount of activity during October, not all the burrows are cleaned out nor are all the new ones begun then. The earliest date I have camped on the breeding grounds is December 1, after which I noticed a great amount of spring cleaning of old burrows by birds without eggs or chicks—birds that I term "unemployed." In the early stages it is important to distinguish the two classes of birds, that is, those which will ultimately breed successfully that season and those which, for some unknown reason, will not.

My belief, supported by my studies of penguins and the Royal Albatross, is that breeding shearwaters are already paired when they arrive and that any courtship subsequently indulged in is merely routine, perhaps serving to maintain the pair bond, and that the decision to breed together is not the result of this behavior on the nesting

grounds. All the evidence I have been able to collect on banded birds indicates that this is definitely true in the Royal Albatross. I do not believe that breeding shearwaters spend much time on the surface of the ground or in flying about the colony; they are mainly in their burrows. Further, their cries do not supply much of the vocal noise that is heard on the islands up to the end of January, and especially in October and November.

The unemployed birds are the noisy and active ones, wandering over the surface of the ground, and indulging in courtship actions with their weird vocal accompaniment. It is these birds, too, which fly about and call out far into the night, issuing from their burrows some two hours before it is time to depart and indulging in an uncanny dawn chorus that is common until the end of January. Frequently I have seen them in pairs and trios. Perhaps this is the true courtship period when individuals, becoming acquainted with each other, may decide to breed together in the next season. Of course, they may arrive at a decision while at sea, and it may even be made, in some cases, during their sojourn in northern waters. Many of my views are contrary to those expressed in the literature, but a close study of banded penguins and petrels has led me to disagree with many written opinions.

Reference to the behavior of another species of petrel may be of interest at this stage. After the customary year's holiday following the raising of a chick, the female of a pair of Royal Albatrosses returned without her mate some time before, in normal circumstances, she was due to lay. She did not produce an egg that year, but for three months at spasmodic intervals was observed receiving attentions from three unmated males. Two of these were marked in previous seasons and were then known to be unemployed. In the following season she returned "married" to one of these banded males and reared a chick with him. At the time of her departure from land the previous season I could not determine which was the successful suitor; it may be that the affair was settled at sea.

There is plenty of evidence that this species locates and associates with its mate at sea. Time and time again I have seen a pair of Royal Albatrosses arrive together to feed a chick in spite of the fact that they had last fed the chick separately. I believe that facts like these should receive serious consideration when one is working out courtship behavior of other petrels. The Sooty Shearwater may quite well behave in a similar manner.

To sum up, the apparently large population of unemployed birds must be carefully considered when interpreting the behavior of any species of petrel, not only at the pre-laying stage but also during incubation and when there are small chicks. Observers frequently have noted freshly excavated burrows when, unknown to them, laying has ceased for that season, and they have wrongly concluded that laying is more protracted than it really is. I have known Royal Albatrosses to build excellent nests some weeks after laying by other birds has ceased. The noting of coition, or attempted coition, at such a period would lead to faulty conclusions. Roberts (1940:232) makes the following interesting comment: "The Wandering Albatross (*Diomedea exulans*) continues to copulate regularly even after the young have hatched." It may be asked what was the status of the birds behaving in this way? Did they belong to the unemployed section or to the section with eggs or young? If the Royal Albatross were being considered, it would certainly not be the latter.

#### INCUBATION

Generally speaking the burrows of the shearwaters on the island of Whero are found only in the sedge and *Stilpocarpa* areas where the soil is deep (up to eighteen inches),

and where it seems to be possible to make a sufficiently long burrow under the roots. A map indicating the zones of vegetation on the island appears in my introductory paper on Whero (1942:88). The burrows vary in length from one foot to about four feet and are excavated in the soft peaty soil. Most of them are single units but there are places where two or more have a common entrance. Situated near the end of the



Fig. 14. Huts of the mutton-birders. Note dense vegetation under which the birds burrow.

burrow, the nest is constructed somewhat roughly of any handy vegetation which has been dragged in. Above the sitting bird there usually exists only a thin layer of soil which easily gives way to the foot if care is not taken. One large white egg, which soon becomes very much soiled, is laid.

When working among the burrows from December 20 to the end of January, I noticed that those containing an incubating bird are not easily seen, for the entrance is overgrown by vegetation. Soil excavated in the spring had long since disappeared either through the action of wind or by being covered with plant growth. The appearance of the burrows of unemployed birds presents a strong contrast, for the entrance is wide open with a mass of soil in front. The condition of the first type of burrow is corroborative evidence that there is little activity in these burrows; what movement there is is confined to the comings and goings of the incubating birds which pursue their course without any dallying.

I can recollect having read somewhere that shearwaters require a dark place in which to nest, but I do not think this is correct, for on Whero I have found a few birds in the western sedge area incubating just within the opening of the burrow. The entrance in all cases was barely noticeable but the bird must have been exposed to considerable amount of light. The absence of Wekas and predatory animals on the island may be an influencing factor.

A perusal of the literature gives the impression, which I believe is erroneous, that the laying period is somewhat protracted. Campbell (1900:894) states that on Macquarie Island it occurs in the latter part of November whereas Hamilton (Falla, 1937:206) found laying still proceeding on that island on December 11. Sandager (1890:291) says the period is from the beginning of December to the middle of January on Moko-hinau Island (Hauraki Gulf). Sladden and Falla (1928:284) give late November or early December for the laying of the eggs they examined on the Alderman Islands (Bay of Plenty). Bent (1922:90) gives nineteen New Zealand records of egg dates between November 16 and April 28 and ten more between November 19 and 26. On Herekopare Island, off Stewart Island, Guthrie-Smith (1914:41) found no eggs in a few burrows examined on November 23, 1911, but he could feel the egg inside one bird. Later (p. 43), he states that eggs may be obtained from November to February, and possibly earlier and later. Cockayne (1909:38), states that all eggs are laid on November 25 wherever the female may be, whether on land or at sea. Guthrie-Smith was able to explode this myth when he visited Herekopare during this vital period. The careful observations of Filhol (1885:53) indicate that on Campbell Island on November 15 there were several recently laid eggs. Fleming (1940:5) noted clean, fresh eggs in a small colony on Hen Island between November 25 and December 4, 1939. Finally, the only shearwater egg I have found early in the season was discovered on the surface of the ground at Taiaroa Head, Otago Peninsula, on November 7, 1936.

From my own observations, recorded in the next paragraph, I am of the opinion that practically all the eggs appear during the last two weeks in November. Such a restricted laying period occurs in several other birds I have studied. With *Pachyptila turtur*, seventy-five chicks under observation in 1941-42 all hatched within eighteen days. Twenty-two Royal Albatross eggs have been laid within a span of thirteen days in eight seasons. My figures for the Yellow-eyed Penguin (*Megadyptes antipodes*) are 174 eggs all laid within a period of twenty-three days in six seasons.

In order to gather first-hand information regarding egg-laying I visited Taiari Island each week from November 6 to 27, 1943. One hundred Sooty Shearwater burrows were marked and examined on each occasion. On November 20 no egg was found and there were very few shearwaters in the burrows as compared with the two previous weeks. A week later, November 27, twenty-four of the burrows contained eggs, twenty-one held a single bird, three a pair of birds, while fifty-two were empty. The eggs were all considerably soiled, indicating that laying had occurred some days earlier. One egg was quite brown so that it was probably laid on November 21. When examined, not one egg, including the brown one, showed any sign, to the eye, of a developing embryo. This confirms my previous impression that with petrel eggs it is not safe to assume that such eggs have just been laid. I do not think that many more of the burrows would acquire eggs. It is of interest to note that these eggs appeared very close to November 25.

Because of my egg record of November 6 and Filhol's of November 15, I had expected eggs earlier and am wondering if 1943 was a late season. The Royal Albatross in 1943 was fully eight days later in laying than in all previous seasons when it has been under observation. For example, the earliest record is November 6 as against November 14 for 1943.

When I arrived on Whero on December 1, 1942, my impression, although I was not able to check it up fully, was that all the eggs had been laid for that season. On Whero, covering three seasons, the earliest hatching date was January 18 with most of the chicks out by January 31. During April the mutton-birders take the chicks from the burrows, but after May 1 they are obtained on the surface at night with the aid of a torch. By May 21 there are very few of these birds left so that the season is really over.

These remarks demonstrate that the range in time of departure is short. Since the hatching and departure periods each covers a space of not more than twenty-one days, it seems reasonable to assume that egg-laying occurs within such an interval also. In my earlier paper on Whero Island (1942:92) I stated that hatching appeared to take several weeks. This view must now be modified.

If we take November 23 as the beginning of the incubation period and January 18 as the beginning of hatching, this means that incubation requires at least eight weeks, or a little longer if the 1943-44 season was a late one. The time required by the Royal Albatross is seventy-eight to seventy-nine days (Richdale, 1942:170). Lockley (1942:103) states that the average for the Manx Shearwater is fifty-one days but he also



Fig. 15. Adult Sooty Shearwater.

quotes elsewhere in the text several records of up to fifty-six days. My longest incomplete record is from December 6, 1942, when a nest was first found, to January 19, 1943, when the chick hatched, a period of forty-four days. I do not know the date on which the egg was laid, but the chick was one of the first hatched that year. From the literature there is very little information to be gleaned regarding the incubation period.

As regards the length of time an adult incubates before being relieved I have not much information. In my earlier paper (1942:100) I have noted that one partner sat for as long as thirteen days before change of guard was effected and that its mate was in charge probably for at least ten days before this.

In 1942-43 I kept sticks across the mouth of a burrow from December 6 to January 20, but during this time I merely looked at the sticks and did not inspect the birds at all for fear they would desert. On the fifth day after placement of the sticks, they were knocked down, then four days later and so on at intervals of 4, 4, 2, 3, 6, 8, 2, and 5 days, making in all 43 days. From this it would appear that change of guard occurred more frequently than previously indicated, but at the same time allowance must be made for the possible entry of unemployed birds, as I did not examine the bands of the incubating birds.

Lockley's records are somewhat similar to mine. His observations (1942:32) on one pair of Manx Shearwaters indicate that shifts of three, four, and five days occurred, the sexes alternating. In a subsequent year (*op. cit.*:82, 84) one bird sat for ten con-



secutive days, beginning two days after the egg was laid, while not long after that the mate had a turn of nine days. Lockley also states that they fasted during these periods and I am sure that this is correct. It is interesting to note that I have a record span of fourteen days for a Royal Albatross (1942:253), seven for *Pachyptila turtur*, and five days for *Pelagodroma marina maoriana*. In *Peleconoides urinatrix* the change occurs nightly (Richdale, 1943:31).

In color the eggs are white and present considerable variation in size and shape, a feature which has been noted by others (Sladden and Falla, 1928:284; Murphy, 1936:667).

Measurements and weights of eggs of Sooty Shearwater taken on Whero Island

	Number	Mean	$\sigma$	Probable error of mean	Range
Length in mm.	72	77.38	2.94	.23	72 to 88
Width in mm.	72	48.26	1.77	.14	44 to 52
Weight in grams	65	92.93	8.47	.7	70 to 115

Eggs showing the extreme measurements, with the weights in parentheses, are as follows:  $88 \times 49$  (115 fresh),  $72 \times 48$  (82),  $72 \times 48\frac{1}{4}$  (81),  $72 \times 45\frac{1}{2}$ ,  $76\frac{1}{2} \times 52$ , and  $76\frac{1}{4} \times 44\frac{1}{4}$  (77). The longest egg was 5 mm. longer than the second longest. The weights which were taken of eggs in all stages of development show a considerable amount of variation. The measurements of the eggs with extreme weights are  $74\frac{1}{2} \times 45\frac{1}{2}$  (70) and  $88 \times 49$  (115 fresh). The average weight of twenty-five eggs known to be fresh was 95 grams, and of forty at an undetermined stage of incubation was 88.5 grams. One egg which appeared very long and narrow when found, measured  $80\frac{1}{2} \times 45\frac{3}{4}$  mm., and weighed 89 grams. I noticed that the egg shells were thinner and more easily broken than those of barn-door fowls.

Authority	Number	Egg measurements given by other observers		Remarks
		Average	Sizes	
Bent (1922:86)	34	$74 \times 48$	$81.7 \times 49.2$ $79.0 \times 53.4$ $58.5 \times 42.5$ $60.5 \times 42.0$	Extremes are in boldface type
Sandager (1890:291)			$82\% \times 47\%$ $75 \times 43\%$	largest smallest
Murphy (1936:667)	9	$74.4 \times 47.2$	$81 \times 45$ $70\% \times 50\frac{1}{4}$ $67\frac{1}{4} \times 44\frac{1}{4}$	Extremes are in boldface type
Buller (1905:103)	1	$59\frac{1}{4} \times 46\frac{3}{4}$		Stewart Is.
Falla (1937:204)	1	$80\frac{1}{2} \times 50$		Macquarie Is.
Oliver (1930:122)	4	$75\frac{3}{4} \times 49\frac{3}{4}$	$70 \times 50$ shortest egg	Chatham Is. and Campbell Is.
Wood-Jones (1936:199)	5	$75 \times 47.6$		Tasman Is.

In the main the measurements given by other writers are the same as mine but there are one or two which are considerably smaller. Bent's last two measurements fit in more with very large Prion eggs, one of Murphy's is a little short, whereas Buller's seems far too short to be that of a normal egg.

Each season a number of deserted eggs was found, many of them on the surface

of the ground, clean and fresh. At the mouths of some of the burrows or just inside were others, very much soiled, for they had evidently been incubated, but nevertheless they were in an edible condition. Also, for some unknown reason, eggs are sometimes scratched out. As an example, on January 29, 1942, one was discovered on the verge of chipping just inside a burrow entrance, and there was no bird in the burrow. The next day at 3 p.m. a bird, which I then banded no. 7, was alone in this burrow. At 2 p.m. on December 25 following, no. 7 was again in the burrow, this time in the company of an unmarked bird. As there was no egg present, both these birds would be members of the unemployed section.

At another burrow which was found empty on first inspection on December 19, 1942, there was plenty of evidence that the birds had been scraping in the loose material, in which I found an egg buried. It is obvious that something occurs at times to upset the normal behavior of the sitting bird.

#### THE NESTLING STAGE AND NORTHWARD MIGRATION

Owing to the considerable amount of material collected, details concerning the nestling stage must await a future paper. Suffice it to say that the earliest hatching within my experience occurred on January 18. An outstanding feature of the chick's life

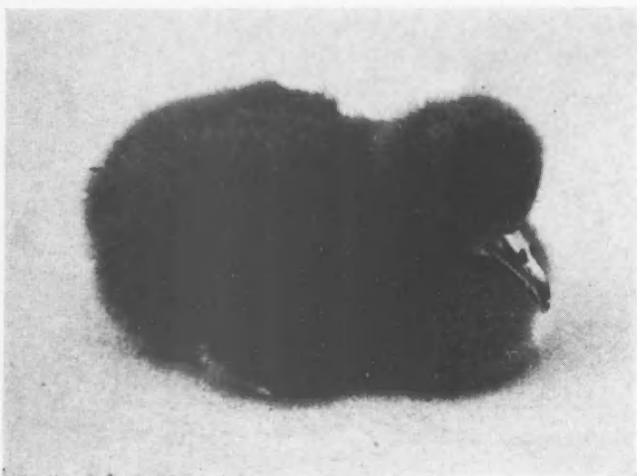


Fig. 16. Sooty Shearwater one day old; January 20, 1942.

in the burrow is the length of time, in one span, that it is left fasting, the greatest I noted being ten days. It is therefore of interest to recall Lockley's discovery (1942:126) that Manx Shearwaters may feed up to 600 miles from their nesting ground while in possession of egg or chick.

As far as I have been able to ascertain the first chicks begin to fly at the very end of April. In that event normal chicks would appear to remain in the burrow not less than ninety-five days. By May 21 practically all that are able to leave land have set out.

It has been said that on the northward migration the old birds precede the young, but I do not think that the order is as sharply defined as this. I am firmly of the opinion



that during the first three or four weeks the flight is made up chiefly of unemployed birds, which according to my observation constitute more than 50 per cent of the population. When I was on Whero on March 14, 1942, I recorded that the nightly arrival of shearwaters dropped to less than 20 per cent of the numbers in December and January, and only half of the number of arrivals for the last week of February. From these observations it will be seen that the unemployed birds were beginning to leave the breeding grounds early in February, and by the first two weeks of March were practically all gone, evidently preparing offshore for the journey north.

I do not think breeding birds leave before the last week in April for the simple reason that, until then, they must be feeding their chicks. In making this statement I am assuming, not without good reason, that the alleged "starvation period" at the end of the chick's life ashore is not very long, probably very little more than a week. This means that at the end of April and during the first two weeks of May breeding birds and fledglings will be flying north together with very few of the unemployed group. At the end of the migratory departure the migrants will probably be predominantly fledglings.

I do not know exactly when the migration begins, but it must be about the end of March. Huge numbers were seen on April 1, 1938, near Shag Point (Rept. Ornith. Soc. N. Z., 1940:5), which is nearly 200 miles north of the main breeding grounds. On April 11, 1936, I observed an endless stream flying north all day near Dunedin. Loomis (1918:132) notes that in California they arrived in strength during the latter part of April and in May. Bent (1922:88, 90) gives the arrival for both sides of the North American continent as May. Loomis (*loc. cit.*) also observes that on February 27, 1907, seventy-five were seen by Mr. Beck and he thinks they formed the vanguard of that year's migration. It is certainly a most unusual record if that is so.

The latest date I have seen shearwaters on the wing at Stewart Island is May 18, 1941, when three solitary individuals were observed. They were probably fledglings.

#### GENERAL OBSERVATIONS

*Nightly arrival of shearwaters on Whero Island.*—In my earlier paper (1942:97) is a table indicating the nightly arrival of Sooty Shearwaters during the first hour, grouped into five-minute intervals. From this survey, lasting for thirty-four consecutive nights from December 22, 1940, to January 24, 1941, much interesting information, which need not be repeated here, was gleaned. During the three months' trip in 1941-42 a survey was made again but in three periods of seventeen, twelve, and sixteen days, respectively, as shown on the dates given in the table below.

Summary of nightly arrival of adult Sooty Shearwaters in 1940-41 and 1941-42

Season	Date of period	Number of days	Number of birds	Nightly average	Range
1940-41	Dec. 22-Jan. 7	17	897	52.8	36-74
	Jan. 8-Jan. 24	17	844	49.1	37-78
1941-42	Dec. 20-Jan. 5	17	956	56.2	25-82
	Jan. 21-Feb. 1	12	611	50.9	37-84
	Feb. 22-Mar. 1	8	181	22.6	7-44
	Mar. 2-Mar. 9	8	84	10.5	8-14

Similar results were obtained in both seasons during December and January, except that in the latter season the number of arrivals shows a greater daily average. This is interesting in view of the fact that 1941-42 was a very poor mutton-bird season. Many are the fantastic theories which have been put forward to explain the cause. In 1941-42 the mutton-birders claimed that the birds did not visit the islands that season and that the burrows had not been cleaned out. They also stated that owing to the number of

ships sunk many birds were destroyed on the southward migration by oil. If conditions on the other breeding areas were similar to those on Whero the lack of young birds was due to some other cause which cannot be arrived at by guesswork.

In January of both years it will be noted that there is a slight decrease in the number of birds. In my previous paper (1942:98) I stated that this was due to the fact that unemployed birds were beginning to depart from the island toward the end of January and that my nest records showed fewer unemployed birds in burrows. This was also applicable in both 1941-42 and in 1942-43. Furthermore, I stated that after January 20 the total would tend to increase, assuming that the chicks would be fed frequently by both parents. But in this statement I was in error. At the time I was not aware that the chicks fasted for many days at a stretch.

It is unfortunate that I did not keep any records between February 2 and 21, 1942, for shortly after I began again it was apparent that the number of birds returning nightly had fallen off considerably. For the first eight days, beginning February 22, the average per night was 22.6 birds and for the last eight days it was only 10.5. It must be remembered, too, that this period represented one of rapid growth for the chicks. Moreover, it seems obvious, that those birds coming home were largely, if not exclusively, parents. This will explain the reason, too, why the mutton-birders when on the islands in April and May do not see very many adult shearwaters. Further, it is questionable whether they are correct in their assumption that the parents, as a result, have deserted their chicks for that season.

Some of the individual nightly arrivals will be discussed in detail in an endeavor to find out any causes for these results. On December 21, 1941, 82 birds came home between 9 and 10 p.m. with 61 on each of the preceding and succeeding nights. There had been a heavy westerly wind till the middle of the afternoon when it dropped, but there was no apparent cause for the return of this large number of birds. On December 26, only 25 came in with 66 and 42 birds the preceding and succeeding nights, respectively. This represented the lowest total for both seasons in December and January; the weather conditions, too, were similar to those of five days earlier.

On January 26, 1942, the record number of 84 was counted with 47 the previous night and 53 the following one. The range for the other eleven nights in this period varied from 37 to 59 birds so that 84 was an outstanding figure. Again there was no apparent reason and weather conditions were similar to those experienced on December 21. Eight of the nine chicks being weighed were fed. Since there were only three other chicks, to my knowledge, in this area and with allowance for having missed several, it is obvious that the unemployed population is considerable.

The smallest total was 7 birds on February 28, with 27 the preceding and 18 the following night. On February 28 only one of the eight chicks surviving in the area was fed. The nights of February 27 and March 1 were very cloudy with a strong southwest wind, whereas on February 28 there was a strong northwest wind with nine-tenths cloud. I am inclined to the opinion that any wind with a southerly tendency brings home more birds, but further investigation on this point is needed.

Population of Sooty Shearwaters on Whero Island

	1940-41	1941-42	1942-43
Breeding birds banded	5	11	33
Breeding birds not banded	11	27	47
Unemployed birds banded	8	19	110
Birds which deserted eggs	6	4	12
Unbanded parents of chicks found on surface	16	....	....
Totals	46	61	202

*Population statistics.*—In working out population figures it is possible that I have counted a bird twice. For example, "birds which deserted eggs" and "unbanded parents of chicks found on surface" may have been caught and banded in either of the two succeeding seasons. The duplication, if any, cannot be very great. The figure 202 shown for 1942-43 does not represent all the birds accounted for that season. There are twelve others not included as they were banded the year before. This brings the total birds for 1942-43 up to 214; 161 of these were residents of the western face which is a little less than half the area of the island occupied by shearwaters. In all, records were taken at twenty-seven nests with breeding birds and at forty-three burrows containing only unemployed birds. There must have been several other breeding burrows which were not found, and there was certainly a considerable number of further unemployed burrows not recorded. I merely recorded those which happened to contain an unemployed bird on the day I first inspected the burrow. While working the area between December 22 and 29, I noted as many as thirty-eight additional clean but empty burrows. It will be realized, I think, that the population of the western face could be reckoned as easily 250 birds. The rest of the island which was not worked thoroughly contained, to my knowledge, thirteen burrows with eggs and twenty unemployed burrows recorded as holding birds. I have every reason to believe that the population of the second portion of the island is as dense as that of the western face, and I consider that 200 birds is not an over estimate. This makes a total of 450 for the whole—fifty more than I gave previously (1942:91).

*Miscellaneous notes on behavior.*—Attempts have been made by several writers to record in written language the cries of the shearwaters, but to me none has been realistic enough to recall the weird noises made by these birds. It is most difficult. I am always reminded of the groans of a man in great pain. Certainly the *tea-tea-tea* sound, said very quickly, is not, as recorded by Buller (1888:233), one of the calls of the shearwater. It is difficult to believe that the Maori name of Titi is derived from this source as stated by Buller. These two statements have erroneously been copied by Bent (1922:88). Buller (1905:102) also gives the amazing report that "they [mutton-birds] go into the bush at night and rob the nests of small birds, taking either eggs or young; and they will also attack meat if hung out of doors."

The various petrels are so numerous on Whero that it always amazes me that there are not frequent collisions. Only once, on December 21, 1941, have I witnessed a collision between two shearwaters. This was accompanied by a loud crack and a cry from one of the birds, but it did not fall to the earth. On another occasion, when it was relatively dark, I saw an early arrival circle its landing place several times before coming straight in to land, but on the way it hit a dead upright tree trunk and fell to the ground. This incident makes me believe that the shearwater does not possess special night vision. On another occasion I saw a bird collide with a dead branch and fall to the ground. Ainslee and Atkinson (1937:241) noted that collisions in mid-air often occurred in the Leach Petrel (*Oceanodroma l. leucorhoa*).

Only once during my long sojourns on Whero have the shearwaters fished close inshore. That day I was able to observe carefully their method of diving. With the wings partly extended they disappeared under the water and rose again with the wings in the same position, from which they frequently took flight. The hand was bent back almost at right angles to the forearm when the bird dived and re-appeared.

*Weights and measurements.*—The bill was measured with dividers from the base of the bill where it touched the feathers to the tip. The depth was taken at the base of the bill and the width on the cutting edges immediately below the base of the bill. To measure the wing I placed a ruler at the extreme end of the carpal flexure and with the

primaries flattened and straightened along the ruler measured to the tip. In dealing with the tail the ruler was placed at the bases of the central retrices and extended to the longest feather.

Weights and measurements of 100 Sooty Shearwaters taken on Whero Island, December 20, 1942, to January 11, 1943

	Mean	$\sigma$	Probable error of mean	Range
Bill length	41.86 mm.	1.56	0.10	38½-45½
Bill depth	14.75	0.56	0.04	13½-16¼
Bill width	13.88	0.57	0.04	12½-15¼
Wing	304.00	6.9	0.46	287-322
Tail	89.61	2.66	0.18	84-99
Toe and claw	67.55	2.17	0.14	62-74
Claw	10.66	0.67	0.04	8½-12
Weight	787 gms.	64.00	4.26	666-978

Average and extreme measurements of Sooty Shearwaters by other observers

Authority	Region	Number	Bill length	Wing	Tail	Tarsus	Toe and claw
Murphy (1930:9)	Atlantic and Pacific coasts of North and South America	40	38-45.6 (41.7)	280-309 (293)	84-99.2 (89.4)	52.5-59.5 (55.4)	50.9-71.5 (63.1)
Loomis (1918:137)	Coast of California	78 ♂ 87 ♀	40.1-47.3 (43) 38.3-45 (41.8)	282-314 (301) 281-318 (299)	80-94 (88) 81-97 (89)	50.3-56.9 (53.3) 50-55.7 (53)	60-69.4 (65.2) 60-68 (64.2)

A comparison of the measurements of 100 birds all taken on a single small breeding island off Stewart Island with those given by Murphy and Loomis from the American coasts supports Murphy's conclusions about the species. He states (1930:8; 1936:669) that "the world-wide individual variation proves to be approximately the same as the individual variation of a fully representative series from a single locality" and further "it seems clear that all Pacific and Atlantic specimens are indistinguishable from the New Zealand form."

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## EARLY REFERENCES TO TERRITORY IN BIRD LIFE

By DAVID LACK

In recent years a number of ornithologists have discovered references to territory in bird life in the writings of early naturalists. All those so far published and again quoted in full by Nice (1941) will not be repeated here. But a number of other references, some of them remarkable, have been overlooked until now. These form the subject of the present paper. [Complete citations in the bibliography are based on sources available to the editors in the library of the University of California. In some instances it has not been possible to examine first editions; citations are based, then, on subsequent editions or on Wood's catalogue (1931).—F.A.P.]

One might perhaps have guessed that so plausible a hypothesis as the food-territory theory would be put forward first by Aristotle (ca. 300 B.C.). "The fact is that a pair of eagles demands an extensive space for its maintenance, and consequently cannot allow other birds to quarter themselves in close neighbourhood" (D'Arcy Wentworth Thompson's translation of "Historia Animalium," 1910:619a). Again, "In narrow circumscribed districts where the food would be insufficient for more birds than two, ravens are only found in isolated pairs; when their young are old enough to fly, the parent couple first eject them from the nest, and by and by chase them from the neighbourhood" (Thompson, 1910:618b). This belief concerning the Raven (*Corvus corax*) is widespread but has not, so far as I know, been checked one way or the other by an ornithologist.

A century after Aristotle, Zenodotus produced the proverb, "Unicum arbustum haud alit duos erithacos" (one bush does not shelter two Robins). The Latin version occurs in various other forms. This is the only other reference to territory by a classical writer of which I am aware.

Conrad Gesner published the third volume of his "Historiae Animalium," subtitled "De Avium Naturae," in 1555 (Gesner, 1617:661). He quoted Zenodotus' statement about the Robin (*Erithacus rubecula*), and himself wrote "Erithacus avis est solitaria." Essentially the same statements appear in a German edition of Gesner's work prepared by Horst (1669:80).

Olina's "Uccelliera" was published in 1622 and includes a clear reference to territory in the Nightingale (*Luscinia megarhyncha*), which is quoted in full by Nice (1941:442). Olina noted that the bird sang in its defended area. A second reference to territory in the same book seems to have escaped attention. Of the Robin, Olina wrote: "Ha per proprio dove stanza di non comportavi compagno, perseguitando con ogni sforzo, chi gli sturba il suo possesso." (It has a peculiarity that it cannot abide a companion in the place where it lives and will attack with all its strength any who dispute this claim.) It may be added in passing that Olina's "Uccelliera" is a delightful book, with attractive plates of many European birds and the various methods for catching them, while one picture shows a group of players on lute, viol, virginals, and various wind instruments "per stimolare il rusignolo al canto."

A seventeenth century English reference to territory in the semi-domestic Mute Swan (*Cygnus olor*) was found by Ticehurst (1934:308; see also Nice, 1941:442).

A French work appeared in 1774, based in part on a translation of Olina and written anonymously. It is of interest here for its elaboration of details concerning territory in the two species, Robin and Nightingale. A translation follows the original French. Of the Robin ("la rouge-Gorge"), it is stated that,

Pendant l'été elle est toujours seule dans les bois, dans les buissons & dans les lieux ensemencés: elle n'aime pas d'avoir d'autres oiseaux autour d'elle; lorsqu'elle a une fois pris possession d'une place, elle poursuit tous ceux de sa grosseur qui veulent y former leur séjour. Il est même passé en proverbes que deux rouges-Gorges ne peuvent pas se trouver sur un même buisson . . ." (anonymous author, 1774:148). Of the Nightingale ("le Rossignol"), it is stated that, "Le Rossignol ne vit point en société de même que les autres oiseaux: aussi ne place-t-il jamais son nid dans le voisinage d'un autre . . ." (1774:5). "Pour chanter, il se place communément dans un lieu le plus convenable à être entendu par sa femelle pendant qu'elle couve, & à pouvoir veiller en même tems [sic] sur son nid: mais il ne se tient cependant pas toujours dans la même place, il en adopte deux ou trois, qui lui paroissent les plus avantageuses. Il s'y rend constamment pour récréer sa femelle par son chant, & pour faire en même temps sentinelle (1774:6).

(In summer, it is always solitary in the woods, scrub and cultivated land: it does not like to have other birds near it; once it has taken possession of a place, it attacks all of its size which try to take up residence there. It has become a proverb that one cannot find two robins in the same bush. The nightingale does not live in company like other birds: and it never places its nest in the neighborhood of another. When singing, he usually selects the place where he can be heard best by the female while she broods, and where, at the same time, he can watch over the nest; but he does not remain to sing always in the same spot, but selects two or three which seem to him the most suitable. He places himself there to please the female by his song, and at the same time to act as a sentinel.)

Buffon's "Histoire Naturelle des Oiseaux," which was written partly by Montbeillard, appeared between 1771 and 1783. I quote from an English translation published in 1793. Buffon noted that the male Robin "chases all the birds of his own species, and drives them from his little settlement" (1793:186). This was perhaps taken from Olina, especially as the only other species in which Buffon mentions territory is the Nightingale. However, in regard to the latter species he goes considerably further than Olina, and provides the second statement in literature of the food-territory theory.

The Nightingales are also very solitary . . . The union between the sexes in the spring seems to increase their aversion to society: they select certain tracts, and oppose the encroachments of others on their territories. But this conduct is not occasioned by rivalry, as some have supposed; it is suggested by the solicitude for the maintenance of their young, and regulated by the extent of ground necessary to afford sufficient food. The distances between their nests are much smaller in the rich countries, than in others which reluctantly yield a penurious supply (1793:89).

This English translation of Buffon, though somewhat free, includes the main ideas; nevertheless, the original French version is added.

Il est aussi-très-solitaire . . . , & lorsqu'au printemps le mâle & la femelle s'apparient pour nicher, cette union particulière semble fortifier encore leur aversion pour la société générale; car ils ne souffrent alors aucun de leurs pareils dans le terrain qu'ils se sont approprié; on croit que c'est afin d'avoir une chasse assez étendue pour subsister eux & leur famille; & ce que la prouve, c'est que la distance des nids est beaucoup moindre dans un pays où la nourriture abonde; cela prouve aussi que la jalousie n'entre pour rien dans leurs motifs, comme quelques-uns l'ont dit, car on fait que la jalousie ne trouve jamais les distances assez grandes, & que l'abondance des vivres ne diminue ni ses ombrages ni ses précautions (Buffon, 1778:98).

In 1772 (published in 1789, however), Gilbert White wrote to Daines Barrington that he attributed the "equal dispersion of birds in the spring over the face of the country" to a "spirit of jealousy" (1822:246); that is, his view was opposite to that of Buffon. His statement is quoted in full by Nice (1941:443), as is also one by Oliver Goldsmith at about the same period (1774:301), in which the word "territory" is used.

George Montagu's "Ornithological Dictionary," published in 1802, was a necessary corrective to the ornate and often inaccurate works of the late eighteenth century. His views on the manner of pair formation in song birds, and the important part played by song in this behavior, are remarkably up-to-date. "The males of song birds, and many others, do not in general search for the female, but, on the contrary, their business in the spring is to perch on some conspicuous spot, breathing out their full and amorous notes, which by instinct the female knows, and repairs to the spot to choose



her mate" (p. xxix). Montagu described the decline in song after a cock bird has acquired a mate (p. xxx), and even carried out experiments with a wild male Redstart (*Phoenicurus phoenicurus*) to show that when its mate was removed, the bird returned to full song (p. xxxii). Montagu also discussed why each species had a different song and correctly concluded that "the peculiar notes of each is an unerring mark for each to discover its own species" (p. xxviii). Charles Darwin, who quoted Montagu's observations in detail in his essay on "Selection in Relation to Sex" (1871:49), could justifiably remark of their author, "Few more careful observers ever lived . . ." Even though repeated by Darwin, Montagu's correct interpretation of one of the most important functions of bird song did not acquire general recognition until rediscovered by Eliot Howard rather over a hundred years later. Both Montagu's and White's parts in the history of the concept of territory are discussed by Nethersole-Thompson (1934).

For other references to territory in the nineteenth century, culminating in Altum's work of 1868, the reader is referred to Nice (1941:443). But it may be worth adding that a number of English writers in this period mention territory in the Robin. Further, three separate workers showed that a Robin would attack a mounted specimen of its own kind, thus anticipating by nearly one hundred years the recent experiments on bird behavior with the help of stuffed specimens (Thompson, 1845:72-74; Morris, 1853:111-113, quoting two observers).

## SUMMARY

Aristotle was the first to subscribe to the food-territory theory. Zenodotus and Gesner noted the solitary nature of the Robin. Olinia mentioned that both Nightingale and Robin held territories. Buffon subscribed to the food-territory theory while, on the other hand, Gilbert White attributed territory to sexual jealousy. Montagu correctly described pair formation in song birds and the part played in it by song.

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*Totnes, Devon, England, February 15, 1944.*

## FOOD HABITS OF BLUE GROUSE

By ROBERT E. STEWART

Food is recognized as an important limiting factor in the abundance and ecological distribution of most species of birds. Because of this, food studies of game birds such as Blue Grouse (genus *Dendragapus*) should be of considerable interest to the ecologist and ornithologist and of primary importance to the game administrator.

The present study is based on the analyses of the crop and stomach contents of 267 adult and 21 juvenal Blue Grouse. The food habits of the two closely related species of Blue Grouse, *Dendragapus obscurus* and *Dendragapus fuliginosus*, are discussed separately, chiefly because of the great difference in the vegetation found within their respective ranges, which reflects itself in the food of these birds. *Dendragapus obscurus*, sometimes called the Dusky Grouse, occurs in the Rocky Mountain region from Yukon south to New Mexico and Arizona and in a few of the higher mountains in the Great Basin. *Dendragapus fuliginosus*, known as the Sooty Grouse, is found on the coastal ranges and on the Cascades and Sierra Nevada, from Alaska south to California. In both species, no essential difference in food was noted between birds found at extreme northern and southern portions of the range.

Seasonal and geographic distribution of specimens of *Dendragapus obscurus*

	Adults													Total year
	Spring Apr.	May	Early summer June	July	Late summer Aug.	Sept.	Fall Oct.	Nov.	Dec.	Winter Jan.	Feb.	Mar.		
Arizona				2		3							5	
British Columbia					4	12	1	2	3			1	23	
Colorado				6	4	6	2						18	
Idaho		1	3	5	12	26	3		4	2	4		60	
Mackenzie			1										1	
Montana	1	2	3	2	5	5					1	1	20	
New Mexico				2	2	3	1	2					10	
Nevada			1	3	2								6	
Oregon			2	2	2		1						7	
Utah							1		1				2	
Washington							2						2	
Wyoming			1	1	8	7							17	
	4		34		101		11			21			171	
	Juveniles													
Alaska					1								1	
Colorado				1	4								5	
Idaho					8								8	
Nevada					2								2	
Utah					1								1	
Wyoming					2								2	
				1	18								19	

The food data concerning *Dendragapus obscurus* were derived from the examinations of the crops and stomachs of 171 adult and 19 juvenal birds, whereas the data concerning *Dendragapus fuliginosus* were derived from the examinations of the crops and stomachs of 96 adults and 2 juvenal birds.

Grateful acknowledgment is made to A. C. Martin of the Fish and Wildlife Service, who assisted with most of the more difficult identifications of food items.

Seasonal and geographic distribution of specimens of *Dendragapus fuliginosus*

	Adults												Total year
	Spring		Early summer		Late summer		Fall		Winter				
	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	
British Columbia	8						1			1	6	8	24
Alaska	2							1		2	1		6
California	11	13		1	1	2		1					29
Oregon	4	1	1	1		6		1				2	16
Washington				3		11	6	1					21
	39		6		20		7	24					96
	Juveniles												
California	2												2

## SEASONAL ASPECT

The foods of Blue Grouse may be presented more or less naturally by means of five seasonal groupings: winter (November, December, January, February, and March); spring (April and May); early summer (June and July); late summer (August and September); and fall (October). The number of specimens examined for certain seasons for both species is meagre and under these circumstances the information may not be especially significant except to indicate in a general way the feeding tendencies. Gravel, which was generally found to occur in appreciable amounts in the stomach and occasionally in small amounts in the crops, is not included in the following summations of food habits.

## WINTER DIET

Type of food	<i>D. obscurus</i> (21 birds)	<i>D. fuliginosus</i> (24 birds)
	Volume per cent	Volume per cent
Coniferous needles	90.2	87.7
Buds and twigs	4.5	1.7
Green leaves (other than coniferous needles)	1.8	4.5
Coniferous cones	-----	-----
Flowers	-----	-----
Fruits and seeds	3.5	6.0
Undetermined plant material	-----	-----
Animal matter	-----	.1

The needles of Douglas fir (*Pseudotsuga taxifolia*) represent the outstanding food (78.2 per cent) of *Dendragapus obscurus* during the winter. Other coniferous needles which were consumed in much smaller amounts include spruce (*Picea*) and pine (*Pinus*). The buds and twigs were of two kinds: cherry (*Prunus*) and willow (*Salix*), while the green leaves were *Anemone* and alum-root (*Heuchera*). The fruit of rose (*Rosa*) was found in fair quantity in one crop, and the fruits of manzanita (*Arctostaphylos*) and juniper (*Juniperus*) were found in very small quantities in others.

Although coniferous needles are the most important type of winter food for *Dendragapus fuliginosus* as well as for *D. obscurus*, the proportions of the various species used are considerably different. The needles of fir (*Abies*) are taken in largest quantity (64.8 per cent) by *Dendragapus fuliginosus*, and other coniferous needles taken in fair quantity include hemlock (*Tsuga*), Douglas fir (*Pseudotsuga taxifolia*), pine (*Pinus*) and spruce (*Picea*). Green leaves taken in small quantity include small cranberry (*Vaccinium oxycoccos*), foamflower (*Tiarella*), spreading wood fern (*Dryopteris dilatata*) and moss. The twigs of dwarf mistletoe (*Arceuthobium*) were found in considerable quantity in one stomach and the buds of aspen (*Populus*) were found in another. The only fruits and seeds eaten were those of salal (*Gaultheria shallon*) and Douglas fir.



Fig. 17. Typical winter habitat of Blue Grouse in Douglas firs. Photo taken in Idaho by W. H. Marshall, March 15, 1940.

#### SPRING DIET

Type of food	<i>D. obscurus</i> (4 birds)	<i>D. fuliginosus</i> (39 birds)
	Volume per cent	Volume per cent
Coniferous needles	26.2	76.5
Buds and twigs	-----	9.2
Green leaves (other than coniferous needles)	34.8	3.6
Coniferous cones	21.2	10.7
Flowers	11.2	-----
Fruits and seeds	4.9	-----
Undetermined plant material	1.7	-----
Animal matter	-----	-----

The crops and stomachs of the four specimens of *Dendragapus obscurus* collected in the spring were found to contain an ample amount of coniferous needles mixed with many other types of food. The needles of Douglas fir were taken in considerable quantity and a small amount of pine needles was also represented. A considerable variety of green leaves was taken, although the only kinds taken in appreciable quantity were those of pussytoes (*Antennaria*), *Eriogonum*, and hawkweed (*Hieracium*). Flowers which were taken in rather small quantities included snowbrush (*Ceanothus*), larkspur (*Delphinium*), cherry (*Prunus*) and pussytoes. The only fruits and seeds taken in conspicuous quantities were those of pink microsteris (*Microsteris gracilis*).

The spring diet of *Dendragapus fuliginosus* continues to be made up predominantly of coniferous needles. In the central part of its range, the needles of fir (*Abies*) and Douglas fir (*Pseudotsuga taxifolia*) are the principal types taken. In the southern part of its range the needles of pine (*Pinus*) are substituted to some extent whereas toward the north the needles of other types such as spruce, especially Sitka spruce (*Picea sitchensis*) are increasingly important. The staminate cones of conifers, especially those of fir and Douglas fir, were found to be fairly important as food during this period. Green leaves were taken in small quantity, especially the leaves of ferns (Polypodiaceae)

and white clover (*Trifolium repens*). The buds and twigs of aspen (*Populus*) were taken in fair quantity by several birds.

## EARLY SUMMER DIET

Type of food	<i>D. obscurus</i> (34 birds) Volume per cent	<i>D. fuliginosus</i> (6 birds) Volume per cent
Coniferous needles	12.9	1.2
Buds and twigs	-----	-----
Green leaves (other than coniferous needles)	22.0	24.1
Coniferous cones	5.1	-----
Flowers	13.2	57.4
Fruits and seeds	33.3	17.3
Undetermined plant material	1.8	-----
Animal matter	11.7	-----

One of the outstanding features of the early summer diet is the great variety of foods that is taken. Nineteen kinds of fruits and seeds were taken by *Dendragapus obscurus*, the most important of which are listed as follows in the approximate order of their importance: manzanita (*Arctostaphylos*), strawberry (*Fragaria*), currant (*Ribes*), sedge (*Carex*), shepherds purse (*Capsella bursa-pastoris*), smartweed (*Polygonum*), buffalo berry (*Shepherdia canadensis*), and honeysuckle (*Lonicera*). A great variety of green leaves was also consumed and the more important of these are listed as follows in the order of their importance: *Eriogonum*, vetch (*Vicia*), willow (*Salix*), buffalo berry (*Shepherdia canadensis*), dandelion (*Taraxacum*), currant (*Ribes*), shootingstar (*Dodecatheon*) and aspen (*Populus*). Various kinds of flowers frequently are taken, especially those of the family Compositae. Those flowers taken in greatest quantity include cherry (*Prunus*), *Eriogonum*, *Microseris*, dandelion (*Taraxacum*) and *Agoseris*. Coniferous needles and cones are still taken in fair amount, especially those of pine (*Pinus*). An appreciable portion of the diet is now made up of animal food in the form of insects. Those which were taken in greatest quantity are scarabaeid beetles (Scarabaeidae), leafhoppers (Cicadellidae) and saw-fly larvae (Tenthredinidae). Ants (Formicidae) were taken frequently but never in large quantity.

Flowers are apparently of major importance in the early summer diet of *Dendragapus fuliginosus*. The flower of cats-ear (*Hypochaeris*) were found to comprise 35.7 per cent of the total. Other flowers of less importance were salal (*Gaultheria shallon*) and sheep sorrel (*Rumex acetosella*). Green leaves were taken in fairly large quantities, especially those of blueberry (*Vaccinium*). Other leaves taken in smaller quantities include black medic (*Medicago lupulina*) and bracken (*Pteridium aquilinum*). The fruits and seeds which were taken in largest quantity were blueberry (*Vaccinium*), red elderberry (*Sambucus callicarpa*), bramble (*Rubus*) and tarweed (*Madia*). One crop examined contained a small amount of hemlock needles.

## LATE SUMMER DIET

Type of food	<i>D. obscurus</i> (101 birds) Volume per cent	<i>D. fuliginosus</i> (20 birds) Volume per cent
Coniferous needles	8.8	4.3
Buds and twigs	-----	-----
Green leaves (other than coniferous needles)	35.3	31.0
Coniferous cones	-----	-----
Flowers	2.9	15.4
Fruits and seeds	44.6	47.1
Undetermined plant material	1.1	-----
Animal matter	7.3	2.2

The late summer is characterized by a bountiful production of food of all types and this is reflected in the varied diet of the Blue Grouse. Fruits and seeds are found in great abundance and a great variety of these is taken as food. Those eaten in greatest quantity by *Dendragapus obscurus* are listed as follows in the approximate order of their importance: blueberry (*Vaccinium*), manzanita (*Arctostaphylos*), pine (*Pinus*), rose (*Rosa*), cherry (*Prunus*), serviceberry (*Amelanchier*), snowberry (*Symphoricarpos*), mountain ash (*Sorbus*) and currant (*Ribes*). Green leaves are also taken in great variety and quantity and the more important of these are listed as follows in the approximate order of their importance: *Eriogonum*, willow (*Salix*), aspen (*Populus*), blueberry (*Vaccinium*), currant (*Ribes*), cherry (*Prunus*), vetch (*Vicia*), pussytoes (*Antennaria*) and clover (*Trifolium*). Coniferous needles were taken in small quantities, especially those of Douglas fir. The needles of spruce (*Picea*), tamarack (*Larix*) and pine were also found in a few crops and stomachs. Flowers were occasionally taken, especially those belonging to the Cichoriaceae. The most important forms of animal food taken were short-horned grasshoppers (Acrididae) and ants (Formicidae).

The late summer diet of *Dendragapus fuliginosus* is in most respects closely similar to that of *Dendragapus obscurus*. Fruits and seeds are represented by a considerable number of species, the more important of which are listed as follows in the order of their importance: blueberry (*Vaccinium*), manzanita (*Arctostaphylos*), bramble (*Rubus*), and mountain ash (*Sorbus*). The most important green leaves taken are blueberry (*Vaccinium*), clover (*Trifolium*), ferns (Polypodiaceae), *Eriogonum*, and hawkweed (*Hieracium*), all of which are listed in order of their importance. Flowers are consumed in considerable quantities during this period, especially those of the cats-ear (*Hypochaeris*). Animal matter, which is consumed in small quantities, is made up principally of three groups: short-horned grasshoppers (Acrididae), leaf beetles (Chrysomelidae) and ants (Formicidae).

## FALL DIET

Type of food	<i>D. obscurus</i> (11 birds) Volume per cent	<i>D. fuliginosus</i> (7 birds) Volume per cent
Coniferous needles	51.0	.....
Buds and twigs	.....	.....
Green leaves (other than coniferous needles)	26.5	41.1
Coniferous cones	.....	.....
Flowers	.....	12.7
Fruits and seeds	22.3	45.3
Undetermined plant material	.....	.6
Animal matter	.2	.3

The fall diet of *Dendragapus obscurus* in many ways represents a transition between the summer and winter diet. Coniferous needles are again consumed in large amounts, especially those of Douglas fir, although pine needles were taken in fair quantity too. Green leaves continue to be taken in ample amounts, those of *Erysimum*, blueberry (*Vaccinium*) and alum-root (*Heuchera*) being taken in greatest quantity. Fruits and seeds continue to hold an important place in the diet, those taken in greatest quantity being mountain ash (*Sorbus*), blueberry (*Vaccinium*) and elderberry (*Sambucus*). One bird was found to have fed almost exclusively on the grain of oats (*Avena sativa*). Animal matter in the fall diet is apparently of negligible importance.

Fruits and seeds and green leaves make up the greater part of the fall diet of *Dendragapus fuliginosus*. The fruits and seeds which were taken in greatest abundance are Douglas fir, sedge (*Carex*), manzanita (*Arctostaphylos*) and blueberry (*Vaccinium*). The more important green leaves taken were alum-root (*Heuchera*), willow (*Salix*),



Fig. 18. Fall feeding area of Blue Grouse. Boise National Forest, December 8, 1939.  
Photo by W. H. Marshall.

ferns and clover. One bird was found to have consumed a considerable quantity of the flowers of the cats-ear (*Hypochaeris*).

#### DIET OF JUVENILES

All the young birds collected in July and August had grown beyond the "downy" stage and are considered as juveniles. No specimens representing the downy stage were available for study.

Type of food	<i>D. obscurus</i> (19 birds) Volume per cent	<i>D. fuliginosus</i> (2 birds) Volume per cent
Coniferous needles	2.6	-----
Buds and twigs	-----	-----
Green leaves (other than coniferous needles)	30.6	-----
Coniferous cones	-----	-----
Flowers	5.4	47.0
Fruits and seeds	26.9	40.5
Undetermined plant material	.3	8.0
Animal matter	34.2	4.5

The diet of juveniles of *Dendragapus obscurus* is about equally divided between green leaves, fruits and seeds, and insects. The leaves of *Eriogonum* were taken in large quantities and those of blueberry, dandelion and cherry were taken in fair amounts as well. Other species of leaves were represented by very small quantities. The more important fruits and seeds are listed as follows: cherry, blueberry, manzanita, serviceberry (*Amelanchier*), smartweed (*Polygonum*) and currant. A great variety of insects was taken, although only the short-horned grasshoppers (Acrididae) and ants (Formicidae) were taken frequently and in large quantity. Flowers were taken occasionally, especially those of the Cichoriaceae. Needles of the Douglas fir were taken a few times in small quantity.

The two specimens of *Dendragapus fuliginosus* examined were found to contain a large quantity of the flowers of the cats-ear (*Hypochaeris*) and a considerable quantity of the fruit of blueberry and sheep sorrel (*Rumex acetosella*). A relatively small amount of animal matter was found, chiefly in the form of short-horned grasshoppers (Acrididae) and ground beetles (Carabidae).

## MAJOR TYPES OF FOOD

*Coniferous needles.*—Coniferous needles probably represent the most important type of food of Blue Grouse since they comprise a predominant portion of the food during the critical winter months; they are fed on in large quantities during the spring and fall and even in small quantities during the summer, when many other types of food are available. The needles of Douglas fir are the outstanding food of this type for *Dendragapus obscurus* whereas *Dendragapus fuliginosus* feeds to a large extent on fir (*Abies*) needles, although needles of Douglas fir are consumed in appreciable quantities too. Both species of Blue Grouse also feed to a considerable extent on the needles of pines and to a somewhat smaller extent on those of spruce. The needles of other conifers which were taken in very small amounts are hemlock (*Tsuga*), tamarack (*Larix*) and yew (*Taxus brevifolia*). Leaf buds enclosing newly formed coniferous needles were frequently taken, indicating some preference for the younger, more tender needles.

Beer (Jour. Wildlife Manag., 6, 1943:32-44) mentions that on Silver Star Mountain, and on East Moscow Mountain, Idaho, Blue Grouse in the winter sought *Abies* almost exclusively although many *Pseudotsuga* were present. He states that the needles of larch were a favorite food during July, August and September. Near Wheatland, Wyoming (Neilson, Condor, 28, 1926:99-100), birds were found feeding largely on needles of pines, in the spring and fall. In central California, Belding (Zoe, 3, 1892: 232-233) found that conifers used were firs (*Abies concolor* and *A. magnifica*) and hemlock spruce (*Tsuga pattoniana* [= *mertensiana*], the latter apparently being preferred. On Kupreanof and Kuiu Islands, Alaska (Swarth, Univ. Calif. Publ. Zool., 7, 1911:56-58), the males remain in the hemlock trees during April, feeding on the foliage and sometimes not leaving a tree for days at a time. Simpson (Amer. Game Conf. Trans., 21, 1935:218-219) found that Blue Grouse in captivity eat many fir and pine needles and some hemlock needles in winter; but they pass up spruce needles if any of the others are available.

*Staminate cones.*—The staminate cones of conifers are consumed in fairly large quantities in spring and in small quantities in early summer. Those which were positively identified to genus or species are pine (*Pinus*), fir (*Abies*), Douglas fir (*Pseudotsuga taxifolia*), and spruce (*Picea*). The small pistillate cones of some conifers, such as hemlock and certain spruce were also taken in very small amounts.

In central California, Belding (*loc. cit.*) found that in one year, when late summer frosts had destroyed the berry and seed crop, the grouse were feeding almost exclusively on the fallen dried staminate cones of the yellow pine (*Pinus ponderosa*) during the fall.

*Buds and twigs.*—Buds and twigs are eaten in small amounts in winter and spring. The prevailing types are aspen, cherry and willow.

*Green leaves.*—Leaves, other than needles of conifers were fed on in fairly large quantities in all seasons except winter, when they represent a very small portion of the diet. A surprisingly great variety of leaves is used as food but those which were eaten most frequently and in greatest quantity are listed as follows in the approximate order of their relative importance: blueberry, *Eriogonum*, ferns, clover, willow, alum-root (*Heuchera*), pussytoes (*Antennaria*), hawkweed (*Hieracium*), dwarf mistletoe (*Arceuthobium*), vetch (*Vicia*), aspen, and currant or gooseberry. With a few minor variations, such as the greater consumption of *Eriogonum* by *Dendragapus obscurus* and the greater consumption of ferns by *Dendragapus fuliginosus*, the types of leaves used as food by the two species of Blue Grouse are similar.

*Flowers.*—Flowers are consumed in appreciable quantities throughout the warmer months of the year. Flowering heads of species of plants belonging to the Cichoreaceae



represent the principal type used as food and are apparently taken in greater quantities by *Dendragapus fuliginosus* than by *Dendragapus obscurus*. The cat's-ear (*Hypochaeris*) is by far the most important flower of this type consumed by *Dendragapus fuliginosus* and it is frequently taken in such ample amounts that it must be one of the preferred foods of that species. Composite flowers which are occasionally taken in fairly large quantities by *Dendragapus obscurus* include: *Agoseris*, *Microseris*, Dandelion, hawkweed (*Hieracium*), and sowthistle (*Sonchus*). Other types of flowers which were infrequently taken include: cherry, *Eriogonum*, salal, snowbrush, and manzanita.

**Fruits and seeds.**—Fruits and seeds were taken in small quantities during winter and spring, but during summer and fall a great variety was taken in large quantities. The fruits of blueberry and manzanita were generally taken in larger quantities and more frequently than any of the others. Other fruits which were occasionally taken in considerable amounts are: strawberry (*Fragaria*), serviceberry (*Amelanchier*), snowberry (*Symphoricarpos*), currant or gooseberry, mountain ash (*Sorbus*), cherry, bramble, elderberry and rose. The small quantities of fruit consumed in winter and spring were largely made up of the more persistent types such as rose and salal. The seeds of smartweed (*Polygonum*) and sedge (*Carex*) were taken quite frequently during the warmer months but never in large quantities. The seeds of conifers, especially those of pine and Douglas fir, were taken a few times in fairly large quantity.

The seeds of *Pinus ponderosa* (Beer, *loc. cit.*) composed 7.17 per cent of the food in eastern Washington and northern Idaho in August, whereas Munro (Auk, 36, 1919: 65-67) mentions that Blue Grouse feed chiefly on the seeds of this species between September 1 and the middle of October in the Okanagan Valley, British Columbia. In central California, Belding (*loc. cit.*) found that the thimbleberry (*Rubus nutkanus*) appears to be the favorite article of diet and next to this the serviceberry (*Amelanchier alnifolia*). He states further that several kinds of currants and gooseberries (including *Ribes sanguineum* and *Ribes menziesii*) and red elderberries (*Sambucus racemosa*) are hardly less acceptable. Beer (*loc. cit.*) states that preference is given to fruits of *Rubus* over nearly any other food and that they formed 17.5 per cent of the yearly diet in western Washington. He also mentions that where hawthorns (*Crataegus*) are abundant they probably form a major part of the diet during the period when they are available. Beer found that salal berries were eaten in large quantities in the coastal areas of Washington, British Columbia and Oregon. In June and July he found that the seeds of *Balsamorhiza* were taken in large quantities.

**Insects.**—Animal food, which is made up almost entirely of insects, was found to comprise a sizable portion of the diet during the summer but was either totally absent or of negligible importance at other seasons. A great variety of adult and larval forms of insects is taken. In the early summer, scarabaeid beetles (Scarabaeidae), leafhoppers (Cicadellidae) and saw-fly larvae (Tenthredinidae) head the list of those taken, whereas in late summer short-horned grasshoppers (Acrididae), ants (Formicidae) and leaf beetles (Chrysomelidae) are the most important. Short-horned grasshoppers, when taken, are generally consumed in larger quantity than the others, while the ants (Formicidae) generally have the highest frequency of occurrence.

The food of juveniles of the species *Dendragapus obscurus* was found to be quite similar to the late summer diet of the adults except that the animal food comprises a much larger proportion while the proportion of fruits and seeds is noticeably reduced. Short-horned grasshoppers (Acrididae) were found to comprise nearly two-thirds of the animal food of juveniles. In the case of juvenal *Dendragapus fuliginosus*, the number of specimens examined was too small to make any generalizations concerning food habits.

In the Powell District of the Lolo Forest in northern Idaho (Cooney, U. S. Forest Service, Northern Rocky Mountain Region, Field Notes on Wildlife, 1, 1938:4-5) the crops of 30 Blue Grouse were collected and examined in September and the most important single item of food appeared to be grasshoppers.

#### SUMMARY

The food habits of Blue Grouse vary from a simple winter diet that is made up predominantly of coniferous needles to a complex diet during the summer months, characterized by great variety of foods including green leaves, fruits and seeds, flowers, animal matter and coniferous needles. The spring and fall, which represent the transition periods between these two, are characterized by feeding habits that are generally intermediate. The diets of the two species of Blue Grouse, *Dendragapus obscurus* and *Dendragapus fuliginosus*, are quite similar as far as major types of food are concerned, but they differ considerably in the species that are taken. Such differences reflect differences in the vegetation within the ecologic and geographic ranges occupied by the two species.

*United States Fish and Wildlife Service, Chicago, Illinois, March 28, 1944.*

## TWO NEW SUBSPECIES OF BIRDS FROM ALASKA

By OLAUS J. MURIE

In the preparation of manuscript for a forthcoming publication on the "Fauna of the Aleutian Islands and Alaska Peninsula," numerous specimens were critically examined at the United States National Museum and the American Museum of Natural History. It became apparent that at least two forms of birds were sufficiently distinct to merit names as subspecies. Because of probable delay in the publication of the entire report, the descriptions of these two new forms are presented herewith.

*Lagopus mutus gabrielsoni*, new subspecies  
Amchitka Rock Ptarmigan

*Lagopus rupestris atkensis* Turner. Contr. Nat. Hist. Alaska, 1886:155-156, part (Amchitka, plentiful); Macoun, Cat. Canadian Birds, 1900:208, part (Amchitka); Macoun and Macoun, Cat. Canadian Birds, ed. 2, 1909:227, part (Amchitka).

*Type*.—Adult male, no. 4150 I. N. Gabrielson Collection; Amchitka Island, Aleutian Islands, Alaska, June 28, 1940; collected by I. N. Gabrielson.

*Description*.—The ground color of the type, representing the summer plumage, varies from ochraceous buff to buckthorn brown (of Ridgway), with local areas approaching pale olive buff. The dark bars are relatively broad and fairly evenly distributed throughout. White spots appear on the throat in moderate number.

*L. m. gabrielsoni* in summer plumage differs from *townsendi* (from Kiska Island) in having heavier and darker barring; on the average this heavy barring extends farther down the flanks and back. In other words, coarse barring is not restricted to the anterior part of the body as in *townsendi*. The ground color is paler, less ochraceous than in *townsendi*.

*L. m. gabrielsoni* differs from *sanfordi* of the islands east of Amchitka in having more uniformly dark ground color and broad bars.

In the autumn plumage of the male the general ground color both above and below is darker than in either *sanfordi* or *townsendi*, varying from buckthorn brown to ochraceous tawny, though the general effect appears darker than either of these colors. There are local spots of ochraceous buff about breast and throat and a few white bars on the throat.

The ground color of the underparts of the adult female in autumn plumage is cinnamon buff or ochraceous buff (not quite agreeing with either); this is broadly banded with black, and there are some white edgings. The upperparts are mostly black, broadly banded with buffy and whitish. The female of *gabrielsoni* is similar to the female of the other middle-Aleutian races. The immature female is similar to the adult female but is paler on the throat and has white spots on the back. The belly and lower flanks retain an earlier plumage, softer and much paler than the fresh plumage over the breast.

The winter plumage is unknown, but it would almost certainly be white.

*Measurements*.—Adult male, 3 specimens: wing, 182-189 (average, 186.3 mm.); tail, 100-110 (105.3); bill from anterior end of nostril, 7.9-9.8 (9.0); width of bill at gape, 11.4-12.2 (11.7); height of bill at angle of gonys, 7.2-8.2 (7.7). Adult female, 3 specimens: wing, 171-179 (174.3 mm.); tail, 85-93 (88.3); bill from anterior end of nostril, 9.4; width of bill at gape, 9.8-11.4 (10.8); height of bill at angle of gonys, 6.7-7.2 (7.0). Measurements were kindly furnished by Dr. Herbert Friedmann, who has measured the ptarmigans in the collections in the United States National Museum.)

*Range*.—*Lagopus mutus gabrielsoni* occurs on Amchitka Island, the type locality, and specimens from both Little Sitkin and Rat Island are referable to this form. We have no specimens from Semipochnoi Island, where we could also expect to find *gabrielsoni*.

*Specimens examined*.—Ten specimens were available for study: three adult males in summer plumage and two in autumn plumage from Amchitka; one adult male in summer plumage from Little Sitkin and one from Rat Island; two adult females and one immature female from Amchitka.

In his work on the "Birds of North and Middle America," Friedmann recently has studied the ptarmigan group and has kindly turned over to me his findings, suggesting that I use what I need for the Aleutian work, even in advance of his own publication on the subject.

Friedmann places all the rock ptarmigans in the Old World species *mutus*.

Study of the Aleutian material bears this out well. There is an easy transition from the American to the Siberian forms, especially through the darker types—*nelsoni* of the Alaska Peninsula and the eastern Aleutians, *evermanni* of Attu Island, and *ridgwayi* of the Commander Islands. Indeed, these three forms are near enough alike to require more than a casual scrutiny to distinguish them, even though *nelsoni* and *evermanni* are separated by several other forms and several hundred miles of islands.

The rock ptarmigans of the Aleutian-Alaska Peninsula district fall into two groups: a dark, more or less blackish group (in summer plumage) and a paler, yellowish group. The dark group occupies the Alaska Peninsula and the eastern Aleutians as far west as the Islands of Four Mountains at least, with a representative subspecies on the extreme western end of the chain, Attu Island, and another representative on the Commander Islands. But in the middle Aleutians, from Atka Island west to Kiska, separating the closely related *nelsoni* and *evermanni*, there is the yellowish group. This group comprises five forms, so distinct from the dark ones that intergradation between the two groups is not apparent. Ordinarily one would be tempted to set aside these middle-Aleutian ptarmigans as a distinct species. Such a course, however, would produce a distributional anomaly, and there are other considerations. There appears to be a tendency among rock ptarmigans to produce light and dark populations. Taverner (Ann. Rept. Nat. Mus. Canada for 1928, 1929:37) has gone so far as to distinguish a northern yellow group and a more southern dark group in continental North America and suggests that there are two color phases. In view of this tendency for a light phase to crop out here and there in the rock ptarmigan population, apparently revealing a genetic possibility common to this group as a whole, it seems advisable to include all forms in one basic species at least until we achieve a better understanding of this interesting condition.

The yellowish ptarmigans of the middle Aleutians themselves fall into two groups. The three eastern forms, *atkhensis*, *chamberlaini*, and *sanfordi* (the hardest to distinguish from one another), comprise a group characterized by pale coloration, but more especially by finer barring in the plumage. The two more western races, *gabrielsoni* and *townsendi*, agree in possessing heavier barring.

Frankly, these races are not easily distinguished. In discussing *sanfordi*, Bent (U. S. Nat. Mus., Bull. 162, 1932:225) honestly remarked: "Although I described and named this race myself (1912) in honor of my friend, Dr. Leonard C. Sanford, who cooperated with me in organizing our expedition to the Aleutian Islands, I must confess that it is only slightly differentiated from the Adak ptarmigan." This expresses quite well the situation among these five forms. Yet, even though slight, the differences are present and it is especially worth while to make note of them in these island habitats where the factor of isolation will continue to operate.

The new form from Amchitka Island is named in honor of Dr. Ira N. Gabrielson, director of the United States Fish and Wildlife Service, who has encouraged work in the Aleutians, who in 1940 furnished additional specimens and observations that were useful in filling gaps in our information for this district, and who collected the specimen used for the type.

*Leucosticte tephrocotis umbrina*, new subspecies

Pribilof Rosy Finch

*Leucosticte griseinucha*, Baird, Trans. Chicago Acad. Sci., 1, 1869:317; Dall and Bannister, Trans. Chicago Acad. Sci., 1, 1869:282; Coues, Check List, 2nd ed., 1882: No. 205; Nelson, Cruise "Corwin," 1881 (1883):67.

*Leucosticte tephrocotis* var. *griseinucha*, Coues, Key N. Amer. Birds, 1872:130; Check List, 1873: No. 144a; Baird, Brewer, and Ridgway, Hist. N. Amer. Birds, 1, 1874:508; Coues, in Elliott's Affairs in Alaska, 1875:174; Elliott, Mon. Seal Islands, 1882:127.

*Leucosticte tephrocotis* (not of Swainson) Harting, Fauna Prybilov Islands, 1875:16.

*Leucosticte griseonucha*, A. O. U. Check-list, 1886:258; Turner, Contr. Nat. Hist. Alaska, 1886:171; Nelson, Cruise "Corwin," 1885 (1887):100.

*Leucosticte tephrocotis griseonucha*, Ridgway, Birds N. M. Amer., pt. 1, 1901:72.

*Leucosticte griseonucha*, A. O. U. Check-list, 1910:246; A. O. U. Check-list, 1931:323; Preble, N. Amer. Fauna No. 46, 1923:88.

*Type*.—Adult male, no. 242705 U. S. Nat. Mus. (Biological Surveys Collection); St. Paul Island, Pribilof Islands, Alaska, June 22, 1914; collected by E. A. Preble, original number 2222.

*Description*.—Similar to *L. t. griseonucha* in general coloration, but breast Prout's brown, mixed with indistinct black streaks and suffusions that give it a darker appearance, graduating to black on the throat. Back almost the same basic color, though appearing paler due to more restricted black streaking and some paler feather edges. The breast color, because of admixture of black, has a more luminous, richer color effect than the mere naming of these tints would indicate. Flanks, belly, rump, and wing coverts suffused or spotted with old rose, more like geranium pink in some lights. Back of neck and cheeks gray, as in other forms of *tephrocotis*. Crown and lores black. Bill black (in breeding season). Feet black.

As contrasted with this, in *griseonucha*, as typified by U. S. Nat. Mus. no. 231449 from Kiska Island, the breast is cinnamon brown or Prout's brown, but the more limited amount of black gives it a paler appearance. The back is even more strikingly pale, having less black and a paler shade of brown.

In measurements there is no significant difference between *umbrina* and *griseonucha*.

Compared with *maxima*, of the Commander Islands, *umbrina* still appears consistently darker. In size, *umbrina* is smaller especially in the wing; this is the chief character distinguishing *maxima* from *griseonucha*. Wing measurements of four male *maxima* are 120-130 (average, 122 mm.). On the other hand, wings of fifteen male *umbrina* measured 112-121 (116.8).

*Measurements*.—Type: wing, 115 mm.; tail, 72.5; exposed culmen, 14.

*Range*.—St. Paul, St. George, St. Matthew, and Otter islands, Bering Sea.

*Specimens examined*.—Fifty-three specimens of *umbrina* from St. Paul, St. George, St. Matthew, and Otter islands; forty-six specimens of *griseonucha* from Aleutian Islands; six specimens of *maxima* from Commander Islands.

*United States Fish and Wildlife Service, Jackson, Wyoming, February 7, 1944.*

## FROM FIELD AND STUDY

**A Deplumed Pileated Woodpecker.**—In front of my residence on the shore of Okanagan Lake is a grove of cottonwoods which are infested with the large larvae of the goat moth (*Cossus*). These attract many woodpeckers, occasionally the big Pileated (*Ceophloeus pileatus*).

On February 5, 1944, I heard the extra loud strokes which indicated that one of these was at work. When I saw him, his appearance was astonishing as he had been denuded of feathers on his back and breast; a few tufts of scanty down remained together with one feather of the dorsal tract. The damage had been done some time before, as the scapulars were commencing to grow again and showed as a long line of black points. Although the temperature was down to 20° F. he did not seem to be suffering.

I have no doubt that he had been in the clutches of a hawk, most likely a Goshawk, and had escaped after being partially plucked. Usually these big, tough woodpeckers are not attacked by hawks; the only record I have of one being killed by a hawk was a bird taken by a Red-tail.

It would be hard to believe that a bird could survive such an ordeal for the length of time it would take a hawk to deplume it if I had not once seen a Bald Eagle on the topmost branches of an enormous dead fir completely deplume an adult male Golden-eye; only the feathers of the head and wings were unplucked. The duck was in the clutches of the eagle for at least twenty minutes, yet when I fired at the eagle with a .22 rifle the duck flew off and made for the nearest water, an extraordinary sight. The snow beneath the tree was littered not only with feathers but also with many strips and fragments of bloody skin with the feathers attached.

For the next two weeks I frequently saw the luckless victim sitting beside small fresh-water pools some distance from the seashore, but I do not think it survived.

I could recount many other instances which disprove the general conception that predators always kill their prey as soon as captured.—ALLAN BROOKS, *Okanagan Landing, British Columbia, February 11, 1944.*

**The Louisiana Heron in Oregon.**—In the latter part of October, George M. Benson of the Malheur National Wildlife Refuge, Harney County, Oregon, reported a small heron of a species unknown to him that had been seen several times on the swamp along the Blitzen River near the Witzel Patrol Station. As Mr. Benson has been familiar with the birds of this region for over twenty-five years, he was instructed to collect the bird so that it might be properly identified. This he did on October 31, 1943. It proved to be a male Louisiana Heron (*Hydranassa tricolor ruficollis*) in first-fall plumage. This species has never before been recorded in Oregon. Its occurrence so far north of the breeding range of the species is just one more example of the wandering habits of herons after the nesting season.—JOHN C. SCHARFF, *Malheur National Wildlife Refuge, Burns, Oregon, February 2, 1944.*

**Brown Pelicans and Breaking Waves.**—On December 12, 1943, at Dillon Beach, Marin County, California, my attention was drawn to four Brown Pelicans (*Pelecanus occidentalis*) which were moving back and forth along the beach in the usual single file. Several times prior to 10:30 a.m. I had noticed four pelicans soaring along the crest of a wave and about ten feet above it. Finally it occurred to me that the four were always the same birds; the second and third birds in the line were in immature plumage. By watching them make a round trip, which measured about three miles, I found that they were the same individuals. Between 10:30 and 11:02 a.m. they made six round trips, or a distance of approximately 18 miles at an average speed of 35 miles per hour.

The wind was offshore and from the northeast, but was not strong. The pelicans soared just inside the mounting wave no matter whether they were going north or south. On the southward trip the speed was apparently greater, but in the 32 minutes I timed them I did not see any individual flap its wings. The altitude varied little, if at all. No fishing was observed, and the birds never pointed the bill downward as is customary when actively fishing.—HARVEY I. FISHER, *Museum of Vertebrate Zoology, Berkeley, California, March 4, 1944.*

**Occurrences of the Blue Goose in New Mexico.**—Through regional officials of the National Park Service we have learned of a recent occurrence of the Blue Goose (*Chen caerulescens*) in New Mexico. Last autumn, a single bird came into a small pond on the Lucero Ranch near White Sands National Monument, west of Las Cruces. There it remained for a time with some domestic ducks. On November 17, 1943, the bird was studied at close range by Messrs. Arthur F. Halloran

and Harry Reed. Mr. Reed submitted two good photographs and a description as follows: "Head white with dark mark over left eye only. Neck white grading into slate black as it joins the body. (Photographs show the dorsal lower half of neck to be dark, not white.—V.H.C.) Beak greenish yellow heavily blocked with black; legs and feet orange. Body: lower breast whitish buff, major part of body and tail slate; tail dark brown to black; upper and lower tail coverts white. Wing feathers slightly edged with whitish (not pure white). The 'honk' is that of a wild goose."

This description and the photographs lead to the conclusion that the bird was a Blue Goose in rather dark plumage. The species is variable in color. Certain specimens of Blue Goose in the collections of the Chicago Museum of Natural History match closely the principal features of the description of the bird at White Sands. Several of the specimens show various black or dark gray markings on the neck, although none has the heavy black mark noted on the bird in question. The information supplied by Mr. Reed does not suggest any of the Old World geese. The closest approach, the barred-head goose (*Eulabeia indica*) of Asia, is distinctly different.

This observation led to a review of reports rendered by Fish and Wildlife field personnel in New Mexico. Gale W. Monson, biologist formerly assigned to the Bosque National Wildlife Refuge, about 90 miles south of Albuquerque, reported seeing an adult Blue Goose there on December 15, 1940, and four adults on December 16. On both occasions the Blue Geese were with a flock of Canada Geese. The birds were studied at a distance of 200 feet with 6x glasses while they were feeding on a bar in the Rio Grande River, and they were positively identified.

In December, 1941, Monson identified three Blue Geese on the Bosque Refuge. Three adults, presumably the same birds, were again noted by refuge personnel on January 31, 1942. A. E. Borell writes that he also saw several Blue Geese in the same area on January 14, 1942.

Mr. Monson's observations of the bird on the Bosque Refuge appear to constitute the first record for the Blue Goose in New Mexico. He suggests that the species is extending its wintering range westward.—VICTOR H. CAHALANE, *National Park Service*, and RICHARD E. GRIFFITH, *Fish and Wildlife Service, Chicago, Illinois*.

**The Nesting Season of the Ashy Petrel.**—When we consider the relatively large number of Ashy Petrels (*Oceanodroma homochroa*) that nest on the Farallon Islands and the proximity of these islands to the metropolitan area of central California, it seems strange that so little information is available regarding certain phases in the life history of this species. This is especially true with respect to the period of incubation and the time required by the young from hatching until the nest is left. Perhaps even more puzzling is the winter range of the Ashy Petrel. No data are available, as yet, to cast any light upon the latter problem. The writer has, however, attempted in the present paper to reach some conclusions about certain phases of the nesting cycle from facts scattered throughout the literature, from oological data and from museum study skins of downy and juvenal young. From the facts here presented, meager as they are, we may reasonably infer that the incubation and nestling period in *Oceanodroma homochroa* does not differ greatly from that of *Oceanodroma leucorhoa leucorhoa* as determined by Gross (Auk, 52, 1935:382-399).

Dawson (Birds Calif., 4, 1924:2026), in reference to the nesting activities of the Ashy Petrel, states that "the bird is occupied with its [the egg's] care and that of the young for fully two months." This would appear to be a considerable understatement of fact. In *Oceanodroma leucorhoa* the time required from hatching until the nest is left was estimated by Gross (*op. cit.*) to be about seventy days, with the incubation period occupying an additional forty-two to fifty days, making a maximum total of around one hundred and twenty days or roughly four months.

The period of egg laying for the Ashy Petrel would appear to extend over several months. Bent (U. S. Nat. Mus., Bull. 121, 1922:162) lists egg dates for this species on the Farallon Islands as from May 15 to July 13. The dates for thirty-nine sets of eggs in the collection of the California Academy of Sciences and records of fifteen additional sets used for exchange extend from June 19 to July 11. Smith (Condor, 36, 1934:171) records several fresh eggs noted in burrows on the Farallon Islands on August 16 and 17. These latter would seem to be exceptionally late dates. The extreme dates for egg laying therefore extend from the middle of May to the middle of August or over a three month period. It is likely that the period of egg laying normally is no longer than two months or from about the latter part of May to the latter part of July with the peak occurring in the latter part of June. In view of the relatively long incubation and nestling period, young hatched from eggs laid any later in the year would not be ready to leave the nest until midwinter at which time all Ashy Petrels have left the Farallons.

The youngest downy of this species in the Academy collection (C.A.S. no. 22171), recorded on the label as being two days of age, was collected on August 15. On August 16 and 17, Smith (*op. cit.*) observed many downy young varying from newly hatched individuals to those which may be esti-



mated to be two weeks of age, judging from his description of the budding remiges. Three specimens in the Academy collection, all taken on September 15, 1911, exhibit marked age differences. The youngest of these (C.A.S. no. 18686) is probably about twelve days of age, being densely covered with down and showing no sign of juvenal plumage. The next older one (C.A.S. no. 18685) has progressed to a stage equivalent to slightly less than forty days for *Oceanodroma leucorhoa* (see Gross, *op. cit.*). The remiges are protruding through the down and the rectrices and rump feathers are present but hidden for the most part by the dense covering of down. The most advanced individual (C.A.S. no. 18684) has the juvenal head, neck, back, wing and tail feathers well developed with only a few traces of natal down adhering to the tips of these contour feathers. The breast and abdomen, however, are still covered with dense down which completely obscures the short juvenal feathers which are present on these parts. It is likely that this individual was at least sixty days old at this time. Complete descriptions of these specimens have been given by Loomis (Proc. Calif. Acad. Sci., ser. 4, 2, 1918:171-172). If we accept these approximate ages, based on the rate of development of a closely related species, these young Ashy Petrels would have hatched about September 3, August 6, and July 17, respectively. Another downy in the Academy collection (C.A.S. no. 22127), taken on November 6, is estimated to be about fifty-five days old which would place the hatching date around September 12. The juvenal feathers of the wings, tail, rump and head are partly grown, with down adhering only the feathers of the back. The ventral part of the body is heavily covered with down and the short juvenal feathers which are present are completely obscured from view.

It is of interest here to record two immature specimens in the collection of the California Academy of Sciences, both of which were taken in the city of San Francisco. To the best of the writer's knowledge there is to date no published record, based upon an actual specimen, for this species from San Francisco. Although the Ashy Petrel is a common breeding bird on the Farallon Islands it has been noted at but three localities on or along the mainland of central California. These are listed by Grinnell and Wythe (Pac. Coast Avif. No. 18, 1927:46) as follows: Point Reyes, Marin County; near Redwood City, San Mateo County (November 9, 1909, and November 16, 1911); Pigeon Point Light House, San Mateo County (April 26, 1897). One of the two above mentioned specimens from San Francisco, an immature female (C.A.S. no. 33549), was found on the corner of Page and Market streets on October 13, 1930. The other, an immature male (C.A.S. no. 57879), was taken while still alive from the mouth of a house cat near one of the amusement stands just east of the Great Highway bordering the Pacific Ocean, a distance of several city blocks south of the Cliff House, on November 14, 1941. Significant perhaps is the fact that both of these birds were young of the year not long out of the nest. Both have a small amount of natal down still adhering to the tips of some of the feathers. The specimen secured on October 13 shows only a trace of down on several of the lateral abdominal feathers and probably had been out of the nest several weeks. The November-taken individual, however, possesses a considerably more extensive patch of down adhering to the tips of the feathers covering the posterior abdominal regions and is believed not to have been out of the nest more than a few days. From these data we may surmise that the period of hatching extends from about the middle of July to the middle of September with the peak occurring about the middle of August which is roughly about fifty days after the peak in egg laying. This would indicate an average incubation period of fifty days for *Oceanodroma homochroa* or essentially the same as in *Oceanodroma leucorhoa*.

We may conclude, therefore, that the nesting period of the Ashy Petrel is exceedingly long, a character which it shares with other storm petrels of the family Hydrobatidae. Judging from data available it may extend over a period of six months on the Farallon Islands or from about the middle of May to the middle of November in extreme instances. As the period of egg laying for the species extends over several months, we may presume that about four months is required for the development of any one individual from the time of egg deposition until the nest is left. Approximately fifty of these days are involved in incubation.—ROBERT T. ORR, *California Academy of Sciences, Golden Gate Park, San Francisco, California, March 1, 1944.*

**American Golden-eyes Feeding on Salmon Eggs.**—Munro (Canadian Field Nat., 37, 1923: 107-116, and Trans. Roy. Canadian Inst., 22, 1939:259-318) has recorded salmon spawn as an item of diet of both American and Barrow golden-eyes. In the first study he found one American Golden-eye which had eaten these eggs, but in the second he reports that twenty individuals had fed extensively on salmon eggs. Most of these birds were taken on Cowichan River in British Columbia. Cottam (U.S.D.A., Tech. Bull., 643, 1939:1-140) studied the food habits of the American Golden-eye from 385 stomachs and he found no salmon eggs. In view of the scarcity of records, it is thought important to record the fact that American Golden-eyes were found to be feeding on the eggs of the sockeye salmon (*Onchorhynchus nerka*) at Flathead Lake, Montana.



Sockeye salmon spawn in considerable numbers along the shores of Flathead Lake during October, November, and December. When I noticed that flocks of golden-eyes were feeding over the spawning beds in the fall of 1941, I took several specimens in order to investigate their food habits. Of six birds taken between December 19 and 21 at Yellow Bay and Boulder Creek on the east shore of the lake, the stomachs of two contained large numbers (78 and 93) of undigested eggs and the other four had eggs which were partly digested and recognizable from the ruptured egg membranes. No other food was found in any of the stomachs. To what extent the golden-eyes are destroying eggs that would hatch if undisturbed is impossible to state. Since the water level in the lake is reduced continuously during the winter months by control of a dam at the foot of the lake, many of the spawning beds are exposed before the eggs hatch in the spring. This manipulation of the water level is undoubtedly much more destructive to the salmon than several hundred golden-eyes which winter on the lake. The sockeye salmon in Flathead Lake is land-locked and reaches a size of about one and one-half pounds before spawning. It is not used commercially but is taken in large numbers by fishermen throughout the year and especially during the spawning season.—PHILIP L. WRIGHT, *Montana State University, Missoula, Montana, January 11, 1944.*

**Avocet on Humboldt Bay, California.**—What may well be the northernmost coastal record for the Avocet (*Recurvirostra americana*) was the sight of a beautiful example of this species standing full leg-depth at the very edge of an almost submerged, pickle weed-covered knoll on Humboldt Bay, California, on January 26, 1944. William Anderson of Samoa, California, and the writer, with binoculars in hand, observed this bird; it was separated by ten feet of glassy water from an immense flock of Marbled Godwits, in which there was a sprinkling of Western Willets.

A Sharp-shinned Hawk approached the long line of Godwits, sailing at a two-foot level, and caused the entire flock to rise. The Avocet took a place in the middle of the flock. The entire line flew ahead of the hawk, gradually rising to a height of sixty feet above the water. At this point the hawk, which had maintained a steady pace, passed in under, seemingly oblivious to the undulating movement of the brown horde above. The godwits circled and returned to the jutting knolls which they formerly occupied. The Avocet, separating from the godwits, alighted in the water at exactly the same spot from which it left when the hawk approached.—C. I. CLAY, *Eureka, California, February 12, 1944.*

**Gulls as Vegetarians.**—Gulls of most species are well known for their scavenging proclivities, so that it should not be surprising to discover that some of the refuse they consume is of vegetable origin. Birds of this family are commonly seen feeding at garbage dumps or outfall sewers. Organic refuse, small fish, large insects, and other animal life constitute their normal food. This adaptability and omnivorousness may be encountered from the arctic regions to the tropics, apparently occurring in most, if not all, species of gulls.

Obviously, an occasional seed or leaf blade might be accidentally or incidentally consumed in the course of feeding, be it in a marsh or water area, for fish or other animal life, or in the upland for insects. Though such traces of plant items have been taken with regularity, it was somewhat contrary to expectation to find certain individuals (at times many) feeding almost exclusively upon plant foods.

Overcrowding and competition for a limited food supply encourage marked deviation from the typical diet and perhaps cause some individuals to acquire the habit of feeding extensively upon plant foods not present in an orthodox gull diet. Such an example comes from the Sacramento Valley of California, where careful investigation showed that a flock of California Gulls (*Larus californicus*) was causing considerable damage to a patch of sprouting barley late in the winter of 1942 and early in the spring of 1943. Two birds from the flock were collected and found to have gorged themselves with the sprouting kernels. This type of feeding has been observed on a number of occasions; it occurs when sufficient rain has fallen to uncover the newly sown barley kernels, temporary puddles making such fields attractive feeding areas.

Presumably because of overabundance, the California Gull in the Salt Lake Valley of Utah is becoming a problem of some concern to cherry growers, as the bird eats and destroys no insignificant amount of the tempting ripe fruit (see Cottam, Condor, 37, 1935:170).

Franklin Gulls (*Larus pipiscan*) in the Prairie States sometimes feed extensively upon wheat, oats, and other grains.

The Herring Gull (*Larus argentatus*) of the Maine coast causes appreciable damage each year to the blueberry crop. Though many exaggerated complaints are received, field investigations have disclosed that depredations of this nature are of annual occurrence and at times the damage is severe. A farmer from Millbridge, Maine, writes that these birds destroyed more than 500 bushels of blue-

berries valued at \$4 a bushel. Stomachs of birds collected in the blueberry fields of Maine have been largely filled with these berries. The late Lt. Robert C. McClanahan (U. S. Biol. Surv. Wildlife Leaflet 141, 1939) described such depredations and outlined a program of prevention and control.

As further evidence that various species of gulls sometimes deliberately choose vegetable foods, the following data are cited from the extensive food-habits files of the United States Fish and Wildlife Service:

Species of gull	Locality	Date	Food	Per cent of volume
Herring	Petit Manan, N. B.	Aug. 2, 1928	107 blueberries	93
	New York, N. Y.	Dec. 1, 1930	Bread garbage	100
	Los Angeles, Calif.	Oct. 20, 1926	Pear peelings	46
Glaucous	Greenland	Aug. 13, 1932	Kelp and other algae, moss plant fiber	9
			Seedheads of <i>Alopecurus alpinus</i> and other grasses	60
	Juneau, Alaska	Jan. 11, 1920	Apple pieces	22
			Gall cases and other vegetable food	8
	St. Paul I., Alaska	April 18, 1915	Marine algae	100
Short-billed	Hayward, Calif.	Feb. 7, 1904	Marine algae	70
Ring-billed	Klamath Falls, Ore.	July 21, 1930	Leaves, flowers, seeds of <i>Bromus</i> , <i>Avena</i> , <i>Echinochloa</i> , <i>Polygonum</i> , and <i>Trifolium</i>	49
	Athabaska Lake, Canada	Aug. 29, 1920	130 seeds of crowberry ( <i>Empetrum</i> )	1
	Bear River, Utah	May 29, 1915	Seeds, plant fiber of sago pondweed	85
	Napoleon, N. D.	July 19, 1915	15 seeds of bulrush	2
Bonaparte	Los Angeles, Calif.	Oct. 20, 1926	Fragments of apple, corn, and tomatoes (garbage)	40
	Lake Erie, Ohio	Nov. 28, 1922	Fragments of tubers	95
	Lake Erie, Ohio	Nov. 28, 1922	Leaves and tubers	11
Franklin	Shoal Lake, Man.	June 5, 1917	Oat kernels	30
	Stump Lake, N. D.	May 11, 1894	Wheat kernels and hulls	74
	Stump Lake, N. D.	May 11, 1894	Wheat kernels and hulls	75
	Heron Lake, Minn.	May 19, 1899	Lemnaceae plant fiber	10
	Napoleon, N. D.	July 17, 1915	Grass plant fiber	10

—CLARENCE COTTAM, *United States Fish and Wildlife Service, Chicago, Illinois, February 19, 1944.*

**A Secondary Function of the Gular Pouch of the White Pelican.**—The extensive bag-like sac associated with the bill of the White Pelican (*Pelecanus erythrorhynchos*) serves primarily as a scooping device enabling these birds to forage effectively for fish. Being continuous at its base with the large and distensible gullet, any food scooped up slides down the alimentary canal if the bill is tilted upward even slightly. Another feature about the bill and pouch is that the young in feeding can insert their heads into the bill and part way down the gullet of the adult and ingest partially digested food which the adult brings up. A possible secondary function of this large pouch structure is suggested by the following observations made by the writer at Gunnison Island, Great Salt Lake, on May 29, 1943.

The nesting season was well along and very few eggs were seen. For the most part adults were standing over and shading young. At some colonies, however, the young were gathered in groups, having left the nesting sites. It was a hot day and young and adults alike were "panting"; that is, they were holding their bills slightly open and were rapidly vibrating their gular pouches. I had noticed this behavior on previous visits to pelican colonies but had not attached any special significance to it. I thought it was possibly a nervous reaction because of our presence. However, on this occasion a breeze came up which had a cooling effect noticeable to the writer and significantly, the vibrating of the pouches of most of the adults ceased and to a large extent the same was true in the young. It then occurred to me that this vibration of the gular pouch was probably similar in function to the cooling device of dogs, when, after great exertion or in hot weather, they pant and "drool" with accompanying dilation of the tongue and oral area. As substantiating evidence it was observed that the tissue making up the gular sac of the pelicans was somewhat transparent and in the strong light it could be seen that the walls were highly vascular. While the pelicans were vibrating the pouches, the blood vessels appeared as prominent dark streaks in clear surroundings.

From these field observations it would seem that the pelicans have a rather unusual device for cooling the blood stream and for temperature regulation. Physiological studies may show this inference to have some merit.—WILLIAM H. BEHLE, *University of Utah, Salt Lake City, Utah, December 1, 1943.*

**A Record of the Old-squaw in the San Joaquin Valley.**—On December 24, 1939, with a view to observing waterfowl, I drove 12 miles from my home in Planada, Merced County, California, to Lake Yosemite, a 500-acre body of water used as a reservoir by the Merced Irrigation Company. Few birds were seen on the lake but a half mile north in a small pond were a few ducks and a dozen Mud-hens. Remaining with the Mud-hens after the others flew away was a whitish duck that I thought resembled an Old-squaw. As it seemed reluctant to leave, I drove back home, got my gun, and returned to the pond where the bird was secured. It proved to be an immature male Old-squaw (*Clangula hyemalis*), the first of this species I have taken in California.—R. H. BECK, Planada, Merced County, California, January 25, 1944.

**The American Redstart in Utah.**—In the early days of ornithological collecting in Utah the American Redstart (*Setophaga ruticilla*) apparently was frequently encountered. Then there is a lapse of several decades before the species is again mentioned in the ornithological literature of the State. Recently the writer had occasion to collect a breeding pair and gather other information bearing on the status of the bird at Ogden. Before presenting these data, however, it seems worthwhile to summarize the early records.

The first report is that of Ridgway (U. S. Geol. Expl. 40th Par., 4, pt. 3, 1877:438) who found the bird to be common in the Salt Lake region. He wrote: "This beautiful little bird was common in summer throughout the Wahsatch district, being one of several eastern species which have their westward range limited only by the commencement of the arid and treeless region of the Great Basin. It was abundant in the valleys and the lower portion of the cañons, but it did not extend far up into the mountains. A few were seen, in June, in the orchard of the 'Church Rancho,' on Antelope Island." Ridgway collected one adult male on Antelope Island on June 4, 1869.

J. A. Allen (Bull. Mus. Comp. Zool., 3, 1872:167) reported one seen on September 8, 1871, near Ogden.

Henshaw (Rept. Geog. Geol. Expl. . . . West 100th Mer. . . . Wheeler, 5, 1875:209) found the species the following year. He stated: "In Utah, the Redstart appears to be of rather frequent occurrence in the wooded section of the lowlands, especially in the alder thickets, along many of the streams." One male specimen was taken by him on July 29, 1872, at Provo.

It would seem from these early reports that between the years 1869 and 1872, at least, the American Redstart was fairly common in northern Utah. Somewhat anomalous, then, is the lapse of some 70 years before the Redstart is again recorded, this time by Twomey (Ann. Carnegie Mus., 28, 1942:449) who reports: "One specimen: two miles south of Jensen. A single male was collected by A. C. Lloyd on August 20, 1935. On September 20, 1937, a pair was seen in some dense willows at the Ashley Creek marshes."

On June 10, 1942, the writer was shown the nest of a Redstart by R. D. and R. L. Porter, James Poorman, and Paul Newey, all young bird enthusiasts of Ogden, Utah. The nest was situated in a cottonwood-willow thicket, 2 miles south of Ogden. It was about 6 feet from the ground and rested in a crotch of a dead willow. The nest was so placed as to overhang a small stream of running water. There were four eggs in it. The pair of birds was soon seen and collected, together with the nest and eggs, all of which are now deposited in the Museum of Zoology at the University of Utah. Incubation had evidently just begun because the eggs were fresh when blown.

These four students first saw Redstarts in their field work around Ogden on June 7, 1940. A nesting pair was seen at that time. After the young left the nest, nothing more was seen of the birds that season. A male was seen on May 22, 1941, but no other records were obtained that year nor were any nests found. On May 23, 1942, a pair of Redstarts was seen and the observation repeated on May 25. On June 10, 1942, the pair was collected as described above. The boys reported that they saw Redstarts in the same area in early June, 1943. In every instance the Redstarts were seen in the cottonwood-willow association that borders the Weber River, and since they were not found elsewhere in extensive field work throughout the region, it appears that they were strictly limited to this habitat.

The finding of the species in the Ogden area for the last four years suggests the regular occurrence of the bird there. Individuals are seemingly not numerous. Also it appears that they are restricted to that one habitat. Thus it may be that the species was simply overlooked in Utah in the interval between 1872 and recent years. It is possible that they are less abundant now than formerly, but in any event the present status of the bird is that of a summer resident in the Ogden area.—AARON ROSS, Department of Biology, University of Utah, Salt Lake City, Utah, November 1, 1943.

**Rare Birds Seen in Southern California.**—In the fall of 1942 a Harris Hawk (*Parabuteo unicinctus*) took up temporary residence on the tops of several telephone poles near Oceanside, San

Diego County, California. As this hawk is seldom seen in coastal southern California, its occurrence caused many to visit the locality to make its acquaintance. Observers were able to approach the bird closely and study it through their binoculars. It was seen on November 1, 1942, by Mr. and Mrs. O. M. Stultz, Caroline Daugherty, Don Eckleberry, and Dorothy Groner. On November 6, 1942, it was seen by Alma Mason, Ruby Curry, Mrs. Kent, and the writer. The hawk was carefully identified as it stretched its wings, preened its feathers, and finally took flight after about twenty minutes.

Also worth reporting is a Glaucous Gull (*Larus hyperboreus*) in second-year plumage seen in the Los Angeles area. Careful study of specimens furnished by George Willett of the Los Angeles Museum verified the identification of this rare gull. It has been carefully studied several times in January and February of 1944 on the same fresh-water lake.—WYATT A. KENT, 815 South Irolo Street, Los Angeles, California, February 21, 1944.

**Specimens of the Pacific Golden Plover from California.**—In 1936 Grinnell (Condor, 38, 1936:219) reported the first specimen of the Pacific Golden Plover (*Pluvialis dominica fulva*) from California. This bird had been taken on January 15, 1922, at Bay Farm Island, Alameda County, but had remained unrecognized among a series of *Pluvialis dominica dominica* until noted by Allan Brooks. Grinnell reported in detail on this bird, pointing out that *fulva* in contrast to *dominica* shows (1) a well-defined dull brownish chest area set off rather sharply from the extensively clear white abdominal area, (2) a more extensive pervasion of clear apricot yellow throughout the dorsal surface, (3) an extension of yellow to the sides of the head and weakly to the pectoral area, and (4) a shorter wing.

Subsequently this bird was examined by Dr. R. A. Falla of New Zealand when he was visiting at the Museum of Vertebrate Zoology in February of 1939. He ventured the opinion that *fulva*, as known to us from this Californian specimen and from those from the Hawaiian Islands, is not the same as what he considers *fulva* in New Zealand. However, no direct comparison with material from New Zealand was then possible, nor has it yet been feasible to pursue this particular problem. There may indeed be a difference. Dr. Falla further suggested to Dr. Grinnell and to me that the California-taken specimen and our Hawaiian material represented adult *P. d. dominica* and that other Golden Plovers in winter plumage from the Pacific coast were immatures; thus one might explain the differences that were presumed to be racial. The breast markings of the bird from Bay Farm Island he accounted for particularly in this way.

This very proper and welcomed criticism lead me, as was intended, to review the identity and age of our material. It seems true generally that the under parts in immature Golden Plovers are more distinctly mottled than in adults, and that this mottling extends down over the belly to greater degree and without sharp delimitation. Birds of known immaturity from Alaska, some with remnants of natal down, invariably show extensive mottling. How infallible this distinction may be is not known, but most of our specimens seem to fall naturally into one of two categories compatible with this interpretation. But it is also equally clear that two races are involved in North America, as has long been agreed. Age for age, the characters of brilliance and extent of gold coloring and wing length hold up along the lines already reviewed above. From western Alaska, the Hawaiian Islands, Fanning Islands, the Philippines, and Siam, there are at hand brightly colored *fulva* which contrast with dull *dominica*. *Fulva* seems to be more sharply mottled beneath in immature plumage and more distinctly banded across the breast in adult plumage. *Fulva* may not prove identical throughout the Pacific Basin, but at the moment, judging from scattered samples, it seems reasonably uniform in this vast area.

The first-reported Californian example of *fulva* still seems, on the basis of characters other than the mottling of the breast, to be of this race; I judge it to be an adult. But also at hand is another Californian example which, beyond all doubt, is a representative of the richly colored *fulva* as known from the Bering Sea area. It is a heavily mottled immature male, no. 5953 in the collection of Ralph Ellis, taken September 10, 1922, at Eureka, Humboldt County, by Franklin J. Smith. It is extensively marked with bright gold above and this color extends on to the sides of the head and breast and even as a dull wash on to the belly. Measurements: wing, 166.5 mm.; tail, 62.7; culmen, 21.7; tarsus, 43.5. For comparison of measurements, see Grinnell (*loc. cit.*) and Ridgway (Birds N. M. Amer., pt. 8, 1919:84, 89). This second specimen is, then, a strongly marked example of *fulva*, and it substantiates the occurrence of this form as an occasional migrant to California. I am indebted to Ralph Ellis for permission to report upon this bird.—ALDEN H. MILLER, Museum of Vertebrate Zoology, Berkeley, California, April 2, 1944.

## NOTES AND NEWS

Beginning with volume 46, the Condor has been printed on a somewhat glossy type of paper. Necessity for change to this stock resulted from unavailability of dull finish papers which we had used before. The new stock is nearly as heavy as that previously employed and should last as well as anything that can be obtained during the war period. Change to a cover of lighter yellow color in the March issue similarly was required by war-time limitations on the paper industry. Perhaps better than its avian counterpart, the Condor Magazine is a species able to adapt to a changing environment.—A.H.M.

We learn with deep regret of the death of Charles E. Hellmayr in Switzerland. He was Associate Curator of Birds in the Chicago Natural History Museum [Field Museum] (for portrait, see Condor, 44, 1942:234) and was known especially for his "Catalogue of Birds of the Americas."

At the Business Meeting of the Cooper Ornithological Club held in Los Angeles on April 6, 1944, approval was voted of transfer of the Club's library to the University of California at Los Angeles. Terms of the gift provide that Club members shall always have access to the library and further that the University will provide storage facilities for the back numbers of the Condor and other publications issued and still owned by the Club. This arrangement thus fortunately establishes a headquarters for this phase of the Club's interest in southern California.—A.H.M.

## MINUTES OF COOPER CLUB MEETINGS

## NORTHERN DIVISION

JANUARY.—The regular monthly meeting of the Cooper Ornithological Club was held on Thursday, January 27, 1944, at 8:00 p.m., in Room 2503 Life Sciences Building, University of California, Berkeley, with Vice-president L. W. Taylor in the chair and 25 members and guests present. Names proposed for membership in the Club were: C. Faye Bennett (Mrs. Louis Jr.), 1736 S. College, Tulsa, Oklahoma, by Alden H. Miller; Mr. Don Bleitz, 5338 Hollywood Boulevard, Zone 27, Hollywood, California, and Mr. Donald Moore, 26 Prospect Drive, Redlands, California, both by Harold M. Hill. The report of the nominating committee was read by Alden H. Miller, for the chairman, Mrs. Dorothy Dean Sheldon. The committee proposed renomination of the present officers to serve for another year. There were no other nominations from the floor and it was moved and carried that the nominations be closed and the secretary instructed to cast a unanimous ballot. The officers for the

coming year remain: president, Robert C. Miller; vice-president, L. W. Taylor; corresponding secretary, Hilda W. Grinnell; recording secretary, Frances Carter.

Mr. C. A. Harwell reported briefly on a recent meeting of the State Division of Fish and Game. Such matters had been discussed as the depredations by ducks in the Imperial Valley and subsequent depredations by night hunters seeking the ducks after open season had been declared on Baldpate and Pintail.

As speaker of the evening, Mr. Malcolm T. Jollie told of "Experiences with Golden Eagles in Colorado." The climax of the evening's program was the presentation of "Smoky," the Golden Eagle which has become so well known on this campus. Although by no means the first eagle raised by Mr. Jollie, Smoky has the distinction of having been hatched in incubator and raised from the egg.

Adjourned.—FRANCES CARTER, *Recording Secretary*.

FEBRUARY.—The regular monthly meeting of the Northern Division of the Cooper Ornithological Club was held on Thursday, February 24, 1944, at 8:00 p.m. in Room 2503 Life Sciences Building, University of California, Berkeley, with President R. C. Miller in the chair and 46 members and guests present. Names proposed for membership in the Club were: Ruth B. Elwonger, 2121 Rose St., Berkeley 7, California, by Hilda W. Grinnell; Mrs. Harold F. Osborn (Florence C.), 4851 Harbord Drive, Oakland 11, California, and Mr. William A. Dill, California Division of Fish and Game, Fresno State College, Fresno 4, California, both by Alden H. Miller.

Mrs. Kelly reported a flock of 100 Avocets in Alameda on February 20 and a flock of Semipalmated Plover which has been present in Alameda all winter. Mr. Dixon reported a European Widgeon at Lake Merritt during the recent duck census.

The speaker of the evening was Mr. Joseph S. Hunter of the California Fish and Game Commission, who discussed the "Duck and Rice Problem in the Sacramento Valley." Mr. Hunter opened his discussion with a brief survey of duck protection in California since 1852, when the first law protecting ducks was passed. Since 1917 the sale of ducks has been prohibited in California. Mr. Hunter believes that though many ducks feed on rice, it is not a good food for them. The principal damage to the rice is done by Pintails whereas the Baldpate is the species largely responsible for damage to alfalfa and lettuce.

Adjourned.—VINCENT MOWBRAY, *Acting Secretary*.

**MARCH.**—The regular monthly meeting of the Northern Division of the Cooper Ornithological Club was held on Thursday, March 30, 1944, at 8:00 p.m., in Room 2503 Life Sciences Building, University of California, Berkeley, with President R. C. Miller in the chair and 93 members and guests present. Minutes of the Northern Division for February were read and approved. The President announced the resignation of Miss Frances Carter as Recording Secretary of the Northern Division of the Club. It was moved that a statement of regret be written in the minutes; Miss Carter had served for seven years in this capacity. R. C. Miller reviewed J. J. Hickey's "A Guide to Bird Watching." Alden H. Miller reported a Saw-whet Owl in the hills south of Hayward on March 25. Mr. Purcell reported a Slate-colored Junco in Tilden Park on February 11. Mrs. Mikesell reported up to 2000 robins roosting in bay and eucalyptus trees in north Berkeley.

Mr. Andrew Shirra Gibb presented his colored motion pictures of western birds. These showed rare species, such as the hooded merganser, and local types of particular interest such as the Black Oyster-catcher and the Pigeon Guillemot. The photographs were noteworthy both for their artistic merit and the activities of the birds which they portrayed.

Adjourned.—**ROBERT W. STORER, Acting Secretary.**

#### SOUTHERN DIVISION

**JANUARY.**—The regular monthly meeting of the Southern Division of the Cooper Ornithological Club was held in Room 145, Allan Hancock Foundation, on Tuesday, January 25, at 8:00 p.m. Dr. Nokes presided, and about 65 members and guests were present. In the absence of the Secretary, Dr. Howard was asked to serve. The following applications for membership were read by Dr. Nokes: Henry C. Kyllingstod, Mountain Valley, Alaska, proposed by Harold Michener; Frank F. Palmer, 1158 Columbia Ave., Ontario, California, proposed by Fletcher G. Palmer; Robert Lincoln Taylor, Box 109, Route 1, Pasadena, California, proposed by W. Lee Chambers; Mrs. W. M. King, 45 West Haven St., Arcadia, California, proposed by Robert B. McLain.

Dr. Nokes called upon Dr. Loye Miller, chairman of the nominating committee, to present the nominations for officers for the Southern Division for 1944. Dr. Miller named Adrian van Rossem for president, Ed N. Harrison for vice-president, and Walter W. Bennett for secretary. Mr. Willett moved that the nominations be closed and that the Secretary be instructed to cast a unanimous ballot for the persons named. It was so ordered.

Mr. Kent stated that he had seen one or two Short-billed Gulls and a Glaucous Gull at Westlake Park. Mr. Cogswell reported having again seen the male Duck Hawk of the pair which he previously recorded at the Pasadena City Hall. Mr. Willett asked for information regarding a report of the killing of ducks in Imperial Valley in closed season. Several others present stated that this had been allowed because the ducks were damaging crops.

Mr. Ed N. Harrison, the speaker of the evening, presented three moving pictures taken by himself and Mrs. Roberts. The first two, which were of the Harrison-Roberts Educational Film series, concerned shorebirds, oceanic birds, and sea elephants and sea lions. The third was a new film of the California Condor, showing many exceptionally fine shots of the soaring flight of the bird and of its manner of moving its tail and portions of the wing in soaring. This last film was shown twice, at the request of the group.

Mr. Harrison's films were followed by a short film taken by Mr. Roger Revelle of Scripps Institute of Oceanography showing the albatross in flight off the southern California coast. The pictures were presented by Dr. Loye Miller.

Adjourned.—**HILDEGARDE HOWARD, Acting Secretary.**

**FEBRUARY.**—The regular monthly meeting of the Southern Division of the Cooper Ornithological Club was held on Tuesday, February 29, 1944, at 8:00 p.m. in Room 145, Allan Hancock Foundation, University Avenue at 36th Place, Los Angeles, with vice-president Ed N. Harrison in the chair. Applications for membership were read as follows: Russell Taplin Norris, Box 847, Preston Laboratories, Butler, Pennsylvania, proposed by W. Lee Chambers; and Dr. Ralph M. Crumrine, 837 So. Hobart, Los Angeles, proposed by Dr. Loye Miller.

The health of the president, Adrian van Rossem, was reported as much improved and he has returned to his home from the hospital. Mr. Walter I. Allen reported that a Painted Redstart is still in the neighborhood of his home in Altadena. It apparently comes in September and leaves the following March. Many local ornithologists have studied it in the course of the present season.

The excellent technique and artistry that has for thirty years placed Mr. William L. Finley in the top rank of American wildlife photographers was again shown the Club in a new series of pictures recently taken by him. Introduced under the subject "Some Stories of Western Bird Life," the Kodachrome slides were some of the most beautiful portrayals of wildlife subjects that have been shown before the Club.

Adjourned.—**WALTER W. BENNETT, Secretary.**



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